NIGELLA SATIVA SEED OIL MEAL AS A SOURCE OF PLANT PROTEIN IN BROILER DIETS

BY

A.A. El-Deek, Saffa M. Hamdy, Y.A. Attia* and M. M. Khalifah**

Poult. Prod. Dept., Fac. of Agri. (El-Shatby), 21545 Alex. Univ, Egypt

** Anim. and Poultry Production Dept., Fac., of Agri. (Damanhour), 22516, Alex. Univ. Egypt*

***Anim. Prod. Res. Insti., Agri. Res. Center. Ministry of Agric.; Dokki, Egypt*

Accepted: **15/10/2008** Received: **25/2/2009**

ABSTRACT: *This work aims to evaluate the possibility of using Nigella seed oil meal (**NSOM**) as a source of protein in broiler diets. Ninety six, one-day old Arbor Acres broiler chicks were randomly distributed into 24 replicates of 4 chicks each. Nigella seed oil meal protein replaced soybean meal (**SBM**) protein at 0, 10, 20, 30, 40 and 50%. 36 chicks were randomly distributed among 6 replicates of 5 birds each and were fed 2 treatment diets based on SBM and NSOM as main sources of protein in the diet.*

Chemical analysis of NSOM indicated high percent of protein, fat, minerals and amino acids. Apparent metabolizable energy (AME) was 3185 kcal/kg and true metabolizable energy (TME) was 3900 kcal/kg. The total protein efficiency suggested that it could be used as a main protein source. The true amino acid availability (TAAA) was higher than apparent amino acid availability (AAAA). Replacing SBM protein by NSOM protein up to 50% did not affect growth, feed intake and feed conversion ratio (FCR). Dressing percentage, abdominal fat, liver, heart, gizzard and pancreas, intestinal length, WBC's, spleen and Bursa were not affected by NSOM protein. Also, chemical and physical characteristics were not affected significantly by the level of NSOM protein.

In conclusion, up to 50 of SBM protein could be replaced by NSOM protein without adverse effects on productive performance, meat quality and immune response of broiler chicks from 1-49 d of age.

INTRODUCTION

The sharp rise in the price of the conventional plant proteins for poultry diets, created a situation that needs more research on seeking alternative protein sources, the condition was even complicated after the use of cereals and oilseeds for production of biofuel (Attia *et al.*, 2008). Nigella sativa seed (Kalanji or black cumin) a by-product of *Nigella Sativa Linn.*, family Ranunculaceae, is a widely distributed herbaceous plant; it generally grows in Mediterranean countries and is cultivated in Egypt. It has been used for centuries, both as a herb or spice and pressed into oil, by people in Asia, Middle East, and Africa for medicinal purposes (Akhtar, 2003). Proximate analysis of NSOM showed protein content ranged from 27.9-34.1%, crude fiber from 10.5 to 14.3%, ether extract from 15.2 to 18.7%, carbohydrates from 23.5-33.2% and ash from 5.5 to 9.5% (Abdel-Aal and Attia, 1993b; Hedaya, 1996; Zeweil 1996; Youssef *et al.*, 1998; Akhtar, *et al.*, 2003; Salem, 2001; Attia *et al.*, 2003; 2008).

Zeweil (1996) reported that NSOM could be successfully included as a protein replacement in the diets for growing Japanese quail up to 13.5%. Attia *et al.* (2003; 2008) showed that Japanese quail chicks and hens can be fed a diet containing 10% NSOM. Moreover, this level can be increased to 20% when supplemented with enzyme. However, higher levels of NSM depressed growth and feed utilization. Al-Beitawi and El-Ghousin (2008) found that inclusion of 1.5% crushed Nigella sativa seeds in broilers ration improved growth and FCR.

The aims of this work was to investigate and evaluate the possibility of using NSOM as a source of protein on the performance of commercial type broiler chicks.

MATERIALS AND METHODS

1-Proximate composition and determination of amino acids:

Chemical analysis for moisture, crude fiber, crude protein, ether extract, ash and minerals were determined according to the procedures outlined by Association of Official Analytical Chemists (A.O.A.C, 1990).

Amino acids composition of NSOM was determined according to the method described by Duranti and Cerlletti (1979) using the Beckman amino acid analyzer Model 118/119CL.

a light microscope at 100x magnification after diluting the blood samples 20 times with a dilitry fluid (3ml acetic acid glacial + 97 ml distilled water+some of Lushman stain) according Hepler (1966).

Physico-chemical Properties of meat:

Thermal shrinkage was carried out according to Walczak (1959), and water holding capacity (WHC) and Plasticity were measured according to Grau and Hamm (1957) as modified by Volovin skaia and Merkoolova (1958).

Statistical analysis:

The statistical analysis was conducted using SAS® (2001) software program. One way ANOVA of GLM procedure of SAS was used. Mean differences were tested by Duncan's New Multiple Range Test (Duncan's, 1955).

RESULTS AND DISCUSSION

a- Chemical Composition

The means values of chemical composition of NSOM are presented in table (2). There were apparent differences in chemical composition as compared with those by Zeweil (1996); Youssef *et al.* (1998) and Akhtar *et al.*, (2003). This could be attributed to the variations in agronomic conditions and method of oil extraction. These results indicate that NSOM had substantial amounts of nutrients that could be used as feed ingredient for poultry. Table (3) shows the mineral contents of the NSOM. It shows high percentage of minerals especially Fe 0.46% and Mg 0.712%. Calcium and total phosphorus percentages of NSOM were found to be 0.29% and 0.93% respectively. Compared to SBM it contains higher percentage of phosphorous and approximately the same amount of calcium

b- Amino Acids Content:

Amino acids content of the NSOM are recorded in Table (4). The results indicate that NSOM protein contained reasonable amounts of all the essential amino acids compared to SBM and corn gluten meal. These results indicate that the values reported by Abdel-Aal and Attia (1993) are much lower in cystine and methionine than those found here and being higher in valine, leucine, and arginine. Meanwhile, these values nearly similar in isoleucine, phenylalanine and histidine. Compared with other plant protein sources, NSOM seems to have comparable amino acids profiles with SBM in leucine, and arginine. However, compared with corn gluten it is similar in threonine, valine, isoleucine, histidine and arginine.

These results indicate that NSOM has a considerable amount of amino acids that could support chicks' growth. Attia et al. (2003& 2008) reached similar conclusion.

Furthermore, AAAA for lysine and arginine were lower than those of SBM (Table, 5). Obviously, hydraulic reaction of NSOM during screw press may be the reason due to high heat generated which causes a considerable damage to the nutritive value of the protein. Comparing with other AAAA of SBM, it seems that NSOM had slightly lower, although when corrected for endogenous amino acid losses the differences being diminished, emphasized the role of endogenous amino acid correction. Likuski and Dorrell (1978) and Attia *et al.* (2003) stated that AAAA values were more variable than the TAAA.

2-Biological Evaluation:

a- True Metabolizable Energy Values (TME):

Values of AME and AME_n were 3185 and 3207 kcal/kg, respectively, while for SBM were 3900 and 3492 kcal/kg, respectively. These indicate that NSOM could also supply the diet with consider amount of ME, that could reduce the amount of corn needed for formulating the diet, subsequently lower diet cost.

b- Total Protein Efficiency (TPE):

Results in Table (6) showed that the growth of chicks fed NSOM tended to increase with the progress. Difference in body weight gain between two protein sources being 5.45% in favor to those fed SBM protein. Feeding NSOM insignificantly increased feed intake by 9.73% as compared to the SBM fed group. The lower growth and the higher feed intake resulted in insignificant increase in FCR. differences in this parameter reached 13.86%. On the other hand, Abou- Egla *et al.*, (2001) found that TPE and FCR of SBM were significantly better than those of NSOM. The value for TPE which reflects the protein quality was 2.32 and 2.00 for SBM and NSOM, respectively.

c- Growth performance of feeding experiments

Live body weight, body weight gain, feed intake and FCR were not affected by the level of NSOM instead of SBM protein (Table 7). There were some evident that at 50% substitution levels growth exhibited ~4.44% decrease with no significant differences among the other groups. These results are in agreement with those reported by Zewil, (1996), Abou- Egla *et al.* (2001), Abdou (2004) and Attia *et al.* (2003 & 2008) who indicated that

2-Bioassay for True Metabolizable Energy (TME) and Apparent and True Amino Acid Availability:

Apparent and true metabolizable energy (AME&TME) values were calculated and corrected to zero nitrogen balance to obtain AME_n and TME_n as described by Sibbald (1976)

The apparent amino acid availability (AAAA) and true amino acid availability (TAAA) values were calculated for each amino acid as described by Sibbald (1986).

3- Biological Evaluation of NSOM Proteins (Total Protein Efficiency (TPE)):

The method by Woodham *et al.* (1972) was employed in this study to determine total protein efficiency. Thirty chicks were used in this trial. Chicks were randomly distributed among six replicates of five chicks each. Two diets were formulated based on SBM and NSOM as a main protein supplement. Each diet was fed to 3 replicates from 14-28 d of age. The 6 replicates were divided into two groups (3 replicates each group).

4-Feeding Experiments:

A total of 96 Arbor Acres unsexed day old broiler chicks were divided into 6 groups of 4 replicates each (4 chicks/ replicate group) and were fed the experimental diets (Table 1) from 1-49 days of age. Nigella seed oil meal protein was replaced SBM protein meal at 0, 10, 20, 30, 40 and 50% (Table 1). The experimental diets were formulated to be isocaloric (2995 and 3163 kcal ME/kg feed) and isonitrogenus (21.8 and 19.00% CP) for starter and finisher, respectively. Other nutrients were adjusted to satisfay nutrient requirements of broilers, NRC (1994).

General Management:

Chicks were randomly distributed into replicates in battery brooders (40×45×60cm). Every treatment diet was fed to 3 replicates of 4 chicks each. Experimental diets and water were offered *ad. libitum* over the experimental period. Chicks in all treatments were kept under similar managerial and hygienic conditions.

Measurements:

Body weight, weight gain, feed intake and feed conversion ratio were determined. At the end of the feeding experiment 4 chicks from each treatment were randomly taken and slaughtered. Liver, spleen, heart and bursa were removed and weighed. Five blood samples were collected to determine total WBC's were counted on a bright line hemocytometer using

NSOM could be used successfully as a plant protein source in broiler and laying hen diets.

The percentage of dressed carcass, abdominal fat, liver, heart, gizzard and pancreas and intestinal length were not affected by NSOM protein (Table 8). Theses results are in agreement with those reported by Abou- Egla *et al.*(2001) and Attia *et al.*, (2008) who found similar results.

Data for WBC's and organs as indication for immune response due to feeding different dietary levels of NSOM are presented in Table (9). There were no significant in spleen and bursa of fabricia weight percentage, WBC's and viability percent as affected by replacing SBM by NSOM. The greatest ($P \geq 0.05$) values of spleen weight were recorded for birds fed 10 and 30% of NSOM, while the greatest bursa values were for birds fed 10 and 40% NSOM. The lowest value of viability percent was for the control birds. Similar results were obtained by Abdou (2004) and El-Deek *et al.*, (1999).

The chemical and physical characteristics were not affected significantly by the level of NSOM instead of SBM protein (Table 10). Our results agreed with Attia *et al.* (2003) and El-Deek *et al.*, (1999).

In conclusion, up to 50 of SBM protein could be replaced by NSOM protein without any adverse effects on productive performance, meat quality and immune response of broiler chicks from 1-49 d of age.

Table (1): Composition and calculated analysis of the starter and the finisher diets used in the experiment

Ingredients	% NSOM protein											
	Starter						Finisher					
	0%	10%	20%	30%	40%	50%	0%	10%	20%	30%	40%	50%
Yellow Corn	53.50	53.5	53.50	53.50	53.50	53.50	68.00	68.00	68.00	68.00	68.00	68.00
Soybean meal (44%)	27.33	24.60	21.87	19.14	16.41	13.68	19.10	16.30	14.50	12.70	10.90	9.04
Nigella seed oil meal (32%)	0.00	3.75	7.50	11.25	15.00	18.75	0.00	2.46	4.93	7.46	9.93	12.40
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
Oil	3.90	3.10	2.34	1.56	0.78	0.04	2.60	2.05	1.55	1.05	0.50	--
Methionine	0.06	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.98	0.06	0.04	0.02
Sand	5.24	4.92	4.76	4.56	4.26	0.00	1.20	1.30	0.94	0.73	0.63	0.00
Total	*100*	*99.89*	*99.97*	*100*	*99.95*	*95.97*	*101*	*100.2*	*100.9*	*100*	*100*	*99.46*
Calculated Analysis, %												
Crude protein	21.80	21.80	21.80	21.80	21.80	21.80	19.00	19.00	19.00	19.00	19.00	19.00
ME (kcal/kg)	2995	2994	2994	2994	2994	2995	3165	3161	3163	3165	3163	3165
C/P ratio	137.4	137. 4	137. 4	137. 4	137. 4	137. 4	166.6	166.6	166.5	166.6	166.5	166.6
Crude fiber	3.00	3.35	3.73	4.09	4.44	4.81	2.75	2.64	3.22	3.46	3.70	3.94
Ca	0.99	0.99	0.93	0.97	0.96	0.95	0.97	0.97	0.96	0.95	0.96	1.00
P, Available	0.47	0.47	0.46	0.49	0.44	0.43	0.46	0.46	0.45	0.48	0.44	0.43
Methionine	0.44	0.59	0.76	0.93	1.10	1.26	0.42	0.44	0.43	0.44	0.46	0.49
Lysine	1.19	1.27	1.36	1.44	1.52	1.61	0.93	0.95	1.00	0.93	0.95	0.98

**Composition of concentrate is Protein 52.00%, fat 5.50%, fiber 3.00%, calcium 9.00%, phosphorus 3.35%, salt 1.00%, vit A 150000 IU/kg, vit D3 30000 IU/kg, vit E 200IU/kg and antioxidant 1.25 mg/kg*

Table (2) :Chemical composition of NSOM[1] used throughout the study

Chemical Constituents	%[2]
Moisture	6.00
Crude protein	32.00
Ether extract	17.70
Crude fiber	14.90
Ash	6.00
N.F.E.	23.40
Total	100

[1] NSOM: Nigella seed oil meal [2] *% on air dry basis*

Table (3) : Some mineral content of NSOM[1]

Minerals	mg/Kg[2]
Calcium (Ca)	2.9
Phosphorus (P)	9.3
Iron (Fe)	4.60
Zinc (Zn)	0.87
Manganese (Mn)	0.29
Copper (Cu)	0.30
Sodium (Na)	0.20
Potassium (K)	0.39
Magnesium (Mg)	7.12

[1] NSOM: Nigella seed oil meal [2] *based on dry samples*

Table (4) Essential amino acids determined in NSOM compared with some other plant protein sources and chicks requirements

Amino acids	NSOM[1]	Soybean meal[2]	Corn gluten meal[3]	Chick requirements
Threonine	*3.56*	1.72	2.94	3.48
Valine	*3.46*	2.07	4.16	3.57
Methionine	*4.98*	0.62	1.14	2.17
Isoleucine	*3.63*	1.96	3.72	3.48
leucine	*4.44*	3.39	9.00	5.87
Phenylalanine	*3.71*	2.16	5.39	--
Histidine	*2.90*	1.17	2.06	1.52
Lysine	*4.35*	3.69	1.48	5.22
Arginine	*2.06*	3.14	2.70	6.14
EAAI	30.06		58.05	

[1] NSOM: Nigella seed oil meal [2] *NRC 1994* [3] *El-Komy, 1995*

Table (5) Amino acids availability values determined for NSOM and SBM

Amino acids	Nigella seed oil meal		Soybean meal[1]	
	AAAA	TAAA	AAAA	TAAA
Aspartic acid	87.30	93.60	93	94
Threonine	81.65	91.22	90	93
Serine	83.70	92.43	92	94
Glutamic acid	88.19	93.68	93	95
Proline	87.73	92.00	92	94
Alanine	81.14	90.67	90	93
Cystine	100.00	100.26	85	92
Valine	79.14	91.32	91	93
Methionine	98.33	98.75	90	94
Isoleucine	78.30	90.96	93	94
Leucine	62.28	84.74	92	94
Tyrosine	72.64	88.49	90	93
Phenylalanine	87.35	96.97	94	95
Histidine	80.06	90.86	91	95
Lysine	77.96	85.47	92	94
Arginine	60.31	90.04	91	93

[1]Likuski and Dorell (1978): data from Likuski and Dorell (1978) indicate that uric acid is degraded to glycine and ammonia during the acid hydrolysis of excreta (Soares et al., 1971), and for this propose data for glysine was not presented.

Table (6) Growth pefroamce of broilers fed SBM and NSOM using total protein efficiency (TPE) method

Parameter	SBM[1]	NSOM[2]
Intial boy weight (g.)	70.67±1.56	70.40±1.76
Final body weight (g.)	153.86±2.15	149.66±1.98
Boy weight gain (g.)	83.2±1.61	78.67±0.67
Feed intake (g.)	194.58±5.70	213.51±4.85
Protin consumption (g.)	35.81±0.52	39.29±0.48
Feed conversion ratio (g./g.)[3]	2.38±0.19	2.71±0.02
Total protein efficiency (TPE)[4]	2.32±0.19	2.00±0.01

[1]NSOM: Nigella seed oil meal
[2]SBM: Soy bean meal
[3]Feed conversion ratio = feed consumption / gain consumption
[4]TPE = Gain / protein

Table (7): Growth performance of broiler chicks fed different substitution levels of NSOM instead of SBM protein.

NSOM[1], %	Body weight (1d., gm)	Body weight (49d., gm)	Weight gains (gm)	Feed consumption (gm)	Feed conversion ratio
0	43.63	1706.43	1662.57	3818.94	2.30
10	44.13	1686.67	1642.27	3909.30	2.38
20	43.25	1720.00	1676.75	3673.52	2.19
30	43.44	1695.40	1651.88	3786.43	2.29
40	43.75	1706.56	1662.81	3896.57	2.34
50	43.75	1632.67	1588.8	3805.93	2.40
SEM	0.88	48.58	52.93	61.69	0.27

[1] NSOM: Nigella seed oil meal

Table (8): Carcass characteristics of broiler chicks fed different substitution levels of Nigella seed oil meal (NSOM) protein instead of soybean meal protein

Parameters	*percent of SBM protein replaced by NSOM protein*					
	Control	*10%*	*20%*	*30%*	*40%*	*50%*
Dressing (%)	71.64±0.65	71.78±0.93	71.27±0.57	72.75±0.40	72.00±0.92	71.74±0.40
Abdominal fat(%)	1.42±0.23	1.17±0.23	1.03±0.18	1.06±0.44	1.47±0.19	1.08±0.33
Liver(%)	1.98±0.18	2.31±0.09	1.99±0.10	1.80±0.07	2.06±0.17	1.94±0.07
Heart(%)	0.47±0.17	0.47±0.15	0.47±0.25	0.45±0.12	0.48±0.23	0.47±0.09
Gizzard(%)	2.44±0.07	2.18±0.20	2.46±0.18	2.18±0.07	2.51±0.24	2.04±0.10
Pancreas(%)	0.24±0.05	0.23±0.03	0.25±0.06	0.25±0.04	0.23±0.02	0.20±0.04
Intestinal length[1]	10.65±1.00	10.48±0.96	9.80±0.92	10.28±0.94	9.89±1.01	9.95±0.98

[1] cm/100g body weight

Table (9): Some immunity parameters of broiler chicks fed different levels of Nigella seed oil meal protein instead of soybean meal protein

Parameters	*Percent of SBM protein replaced by NSOM protein*					
	Control	*10%*	*20%*	*30%*	*40%*	*50%*
White Blood cell 10^3/ml	4.520±1.084	5.225±0.406	4.482±0.670	4.408±0.531	4.865±0.465	3.615±0.149
Spleen	0.13±0.02	0.15±0.01	0.13±0.02	0.15±0.14	0.12±0.02	0.12±0.01
Bursa of fabricia	0.08±0.01	0.11±0.03	0.09±0.02	0.10±0.02	0.11±0.02	0.10±0.01
Viability %	87.50	93.75	100.00	93.75	100.00	93.75

Table (10): Chemical and physical characteristic of fresh meat of broiler chicks fed different levels of Nigella seed oil meal protein instead of soybean meal protein

Parameters	**percent of SBM protein replaced by NSOM protein**					
	Control	**10%**	**20%**	**30%**	**40%**	**50%**
Dry matter %	90.56±0.64	91.90±0.69	90.30±0.76	89.20±0.84	90.86±0.50	91.56±0.50
Protein %	19.12±0.45	19.29±0.58	19.28±0.32	19.44±0.48	19.19±0.18	19.06±0.12
Fat %	1.76±0.11	1.85±0.12	1.79±0.08	1.77±0.06	1.71±0.09	1.80±0.10
Ash %	4.76±0.34	4.52±0.35	4.55±0.44	4.40±0.28	4.92±0.15	5.01±0.26
Bound Water	98.67±3.60	99.19±3.10	97.62±3.21	99.69±3.25	98.90±3.11	97.96±3.35
Plasticity	0.29±0.05	0.33±0.02	0.31±0.04	0.28±0.29	0.29±0.02	0.30±0.03
Thermal Shrinkage	17.81±0.70	19.19±2.23	15.64±2.9	16.38±5.50	20.25±3.97	18.68±4.67

REFERENCES

Abdel-Aal, E-S. M. and R. S. Attia (1993b). *Characterization of Black Cumin (Nigella Sativa) seeds 2- Proteins. Alex. Sci. Exch. Vol. 14, No. 4 P:483-496.*

Abdou, Zenab, M. (2004). *Effect of phytase supplementation on the utilization of Nigella sativa seed meal in broiler diets. Egyptian Poultry Science, 24:143-162.*

Abou-Egla, E.S. ; Salwa G. K. Genedy, A.E. Abou-Zeid and H. S. Zeweil (2001). *Nigella sativa seed oil meal as a nontraditional source of plant protein in Japanese quail diets. Egyptian Poultry Science, 21:107-125.*

Akhtar M S, Nasir Z and Abid AR. (2003). *Effect of feeding powdered Nigella sativa L., seeds on poultry egg production and their suitability for human consumption. Veterinary Archive, 73:181-190.*

AL-Beitawi, N. and S.S. El-Ghousein (2008). *Effect of Feeding Different Levels of Nigella sativa Seeds (Black Cumin) on Performance, Blood Constituents and Carcass Characteristics of Broiler Chicks. International Journal of Poultry Science 7 (7): 715-721.*

A.O..A.C (1990). *Association of Official Analytical Chemists. "Official Methods of Analysis. 14 th Ed. published by the A.O.A.C, Washington, D.C., USA*

Attia, Y. A., A. E. Tag El-Din, H. S. Zeweil, and M. A. Arafat (2003). *Nutritional evaluation of nigella seed meal and the effect of microbial phytase and amino acids supplementations on its feeding value for Japanese quail. pp. 201-217 in: Proc. 3rd Conference on Animal Nutrition. 14-17 October 2003. Hurghada, Egypt.*

Attia, Y. A.; A. E. Tag El-Din; H. S. Zeweil , A. S. Hussein, E. M. Qota and M. A. Arafat (2008). *The effect of supplementation of enzyme on laying and reproductive performance in Japanese quail hens fed nigella seed meal. Journal of Poultry Science 45:110-115.*

Duncan, D. B.(1955). *Multiple range and Multiple Test Biometrics, 11:1-42.*

Duranti, M. and P. Cerlletti. (1979). *Amino acid composition of seed protein of lupinus albus. J. Agnic. Food chem. 27.977.*

El-Deek, A. A.; Saffa, M. Hamy and M. M. Khalifah (1999). *Effects of Nigella seed oil meal in broiler diets on performance and physical*

and sensory characteristics of meat. TFI Annuals meeting, July 24-28, Chicago, USA

El-Komy, A. (1995). *Nutritional evaluation of corn gluten meal as a protein source in duck Muscovy rations. M. Sc Thesis Faculty of Agric., Alex. Egypt*

Grau, R. and F. Hamm (1957). *"Uberdas wasser bnddung svermogen des sausugetier muckels" 11. uber die bestimmug der wasserbindung des muckles Zilebensmittel unter such. und-forshung, 105, 446 - 460.*

Hepler O. E. (1966). *Manual of clinical laboratory methods. Thomas, sparing field. ILL inois.*

Hedaya, S.A., (1996). *Effect of Niglla sativa seeds (Black seeds) extract on some hematological and biochemical parameter in rats. Frst. Sci. Cong., Fac. Vet. Med. Alex., Univ., 17-19 Oct. Alex, Egypt*

Likuski, H.J.A., and H.G Dorrell (1978). *A bioassay for rapid determination of amino acid availability values. Poultry Sci. 57: 1658-1660.*

N.R.C (1994). *Nutrient requirements of poultry 8th ed. National Academy Press, Washington, DC*

Salem, M.A. (2001). *Effect of some heat treatments on Niglla sativa seeds characteristics. 1-some physical and chemical properties of Niglla sativa seeds oil. J. Agric. Rec., Tanta Univ., 27: 471-486.*

SAS institute (2001). *SAS user's guide: Statistics, Version 10th Edition. SAS institute Inc., Cary NC.*

Sibbald, I. R., (1986). *The T.M.E. System of Feed Evaluation: Methodology, Feed Composition Data and Bibliography. Technical Bulletin 1986-4E. Research Branch, Agriculture Canada, Ottawa*

Volovin Skaia, V.P. and Mer koolova, V.K. (1958). *Methods for determination of meat water Holding capacity, office of Technical Information, Allunion volume I page 21, 27.*

Walczak, Z. (1959). *Laboratoyina metoda oznacania zawartosci galarty wkonserwach miesnych rocz. naul roln 92 : 619-625.*

Woodham, A.; S. Savie; B.J. Ayyash and S.I. Gordon (1972). *Evaluation of barley as a source of protein for chicks. II. Nutritional Assessment of barley of differing variety and composition as complements to protein concentrates.J.Sci. Fd.Agric. 23:1055.*

Youssef, M.M; Abdiene A.M; Khattab R.M. and Darwish S.A. (1998). *Effect of feeding Nigella sativa cake on production and reproduction performance of buffaloes. Egyptian Journal of Nutrition and Feeds, 1:73-85*

Zeweil H.S. (1996). *Evaluation of substituting Nigella seed meal for soybean meal on the performance of growing and laying Japanese quails. Egyptian Poultry Science, 16:451-477.*

الملخص العربي

كسب حبة البركة كمصدر للبروتين النباتي في علائق دجاج اللحم

أحمد أحمد الديك و صفاء محمد حمدي و يوسف عبد الوهاب عطية* و محمد معوض خليفة**

قسم انتاج الدواجن-كلية الزراعة - جامعة الاسكندرية

قسم الانتاج الحيواني و الداجني - كلية الزراعة - فرع دمنهور- جامعة الاسكندرية

معهد بحوث الانتاج الحيواني - مركز البحوث الزراعية - وزراة الزراعة

أجريت هذه الدراسة لتقييم كسب حبة البركة من حيث التحليل الكيماوي و محتواه من العناصر الغذائية و الاحماض الامينية الكلية و النافعة و الطاقة الممثلة و الاملاح المعدنية و الكفاءة الكلية للاستفادة من البروتين حيث استخدم في الاخيرة ثلاثون كتكوت عمر ١٤ يوم قسمت بين مجموعتين و أجريت تجربة أيضا باستخدام ٩٤ كتكوت من سلالة الاربراكرز عمر يوم من دجاج اللحم في الفترة من ١-٤٩ يوم من العمر وزعت بين ٥ معاملات غذائية حيث حل كسب حبة البركة محل صفر و ١٠ و ٢٠ و ٣٠ و ٤٠ و ٥٠% من بروتين كسب فول الصويا و درست الصفات الانتاجية و جودة اللحم و وعدد كرات الدم البيضاء و دلت النتائج علي احتواء كسب حبة البركة على كميات مناسبة من البروتين و الدهن و الاملاح المعدنية و الاحماض الامينية الكلية و النافعة الظاهرية و الحقيقية و بلغت قيمة الطاقة الممثلة الظاهرية ٣١٨٥ كليو كالوري /كجم علف و الطاقة الممثلة الحقيقة ٣٩٠٠كليو كالوري /كجم علف و اوضحت نتائج كفاءة الكلية للبروتين ان كسب حبة البركة يمكن استخدامها كمصدر للبروتين في علف دجاج اللحم و اتضح ان الاحماض الامينية النافعة الحقيقة اكبر من تلك الظاهرية و اثبتت النتائج انه يمكن احلال حتي ٥٠% من بروتين حبة البركة محل بروتين كسب فول الصويا كما ان كسب حبة البركة ليس لها تأثير ضار علي معدل استهلاك الغذاء و معدل التحويل الغذائي و لم تتأثر ايضا النسبة المئوية للاعضاء الداخلية و طول الامعاء و جودة اللحم و بعض الشواهد المناعية كالنسبة المئوية للطحال و غدة فبريشا و عدد كرات الدم البيضاء.

و خلاصة القول انه يمكن استخدام حتي ٥٠% من بروتين كسب حبة البركة ليحل محل نفس النسبة من بروتين كسب فول الصويا بدون نتائج سالبية علي الصفات الانتاجية و جودة اللحم و عدد كرات الدم البيضاء و الوزن النسبي للطحال و غدة فبريشا كدلائل للاستجابة المناعية للطيور.