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EFFECT OF DEITARY INCLUSION LEVEL OF DISTILLERS DRIED GRAINS WITH SOLUBLES ON GROWTH PERFORMANCE OF DOMYATI DUCKLINGS

By

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Abstract : *A total number of 480 Domyati ducklings one-day-old were selected, weighed, and divided into four treatment groups of 3 replicates each to investigate the effect of using corn distillers dried grains with solubles (DDGS) in the diet at levels of 0 , 6 , 12 and 18 % from one-day until 84 days of age on growth performance, digestibility coefficients of nutrients, carcass traits, some blood constituents, and economic efficiency .*

Results indicated that live body weight (LBW), body weight gain (BWG) were insignificantly improved by feeding diets with different DDGS levels as compared with those birds fed the control diet during the whole experimental period (1- 84 d). Records of feed consumption (g/duck/28 day) were slightly increased without significant for the groups fed dietary DDGS treatments as compared to the control group during the whole experimental period. Feed conversion ratio (g feed / g BWG) values were insignificantly improved by 2.12 % for the group fed 18 %CDDGS as compared to those fed control diet during the whole experimental period (1– 84 d). Mortality percentage was not significantly affected due to any dietary treatment. All nutrients digestibility coefficient were insignificantly improved by feeding dietary treatments. All carcass traits for both Domyati female and male ducklings were insignificantly affected due to feeding varying DDGS levels except of abdominal fat, which was significantly increased by feeding 12 % DDGS as compared to all other treatment groups. All plasma constituents of both female and male ducklings were insignificantly increased by feeding diet contained different DDGS levels except for plasma total cholesterol which was decreased for the groups fed 12 and 18 % DDGS as compared with those fed the control diet of female ducklings only. The economic efficiency values were directly improved by increasing DDGS up to 18 % in the diet as compared to the control by 22.26 %. These results indicated that corn DDGS could be used in duckling diets up to 18 % without any adverse effects on productivity and profitability of Domyatiducklings.

INTRODUCTION

Distillers dried grains with solubles **(DDGS)** is a co-product which is generated from the production of corn based ethanol ***(Rosentrater, 2006)***. The vast increase in ethanol production over the last 5 to 10 yr has led to an increased supply of DDGS that is available for livestock feed ***(Batal and Dale, 2003 and Noll et al., 2007).*** Production of ethanol from 100 kg of corn using the dry-milling method produces approximately 34.4 kg of ethanol, 34.0 kg of carbon dioxide and 31.6 kg of distillers dried grains with solubles ***(Renewable Fuels Association, 2005)***.

Previous research has shown that DDGS can be successfully fed to poultry ***(Parsons and Baker, 1983; Olentine 1986; Noll et al., 2001).*** Because distillers dried grains with solubles (DDGS) is a source of

protein/amino acids, energy and available phosphorus for poultry and the nutrient fractions (protein, oil and fiber) are 2 to 3 times more concentrated in DDGS compared to corn Creswell *(2006)*. Also, the high price of corn and soybean meal resulted in increase of DDGS level in poultry diet than has typically been used in the past.

Waldroup et al. (1981) reported that when DDGS were included into broiler diets with the ME content held constant up to 25% DDGS could be used without reduction in body weight or feed utilization. Similarly, ***Potter (1966)*** found that isonitrogenous broiler diets with 20 % DDGS supported performance equivalent to control diets when fed to broiler up to 8 wk of age. ***Lumpkins et al. (2004)*** indicated that DDGS from modern ethanol plants can be safely used at 6% in broiler starter diet and 12 to 15% in grower and finisher diets. ***Wang et al. (2007a and b)*** reported that broilers can be fed 15% DDGS on a constant basis without affecting carcass composition or growth. Even though no published research could be located regarding the effects of feeding DDGS on ducklings growth performance.

The objective of the this study was to evaluate the effect of increasing dietary levels of corn DDGS in ducklings starter and finisher diets on growth performance, carcass traits and some blood constituents as well as economic efficiency during growing period (12 wks).

MATERIALS AND METHODS

This study was carried out at El – Serw Water Fowl Research Station, Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, and Egypt. The experiment was conducted from August to November 2010. Four hundred and eighty unsexed Domyati ducklings of one-day-old were weighed and randomly distributed into four experimental groups; each group contained 120 ducklings divided into equal three replicates. Ducklings in all treatments were reared under similar hygienic and managerial conditions. They were housed in well ventilated brooding pens (1.75 x 3.50 m) from one-day up to 3 weeks of age, then allowed to go to out in yards. Wheat straw was used as a litter; feed and water were provided ad-libitum throughout the experimental period. Corn dried distillers grains with solubles (DDGS) was provided by Cairo Poultry Company. Four diets were formulated of both starter and finisher period and contained 0 , 6 , 12 and 18 % corn DDGS (27% CP, 0.17% Ca., 0.72% Phos., 0.6% Meth., 0.75% Lys., 0.48 % Sod., and 2820 kcal/kg ME) . Starter diets were fed from one to 42 days, then finisher diets were fed from 43 to 84 day of age. The composition and calculated analysis of the experimental diets are shown in Table (1).

Data collection:

Live body weight (LBW) and feed consumption (FC) for each replicate for all treatments were recorded , then were averaged and expressed in grams per duck / 28 days throughout the experimental period (84 day of age). Body weight gain (BWG) and feed conversion ratio (FCR) were also calculated during the same periods.

Nutrients digestibility:

At 70 day of age, 12 Domyati male ducklings (three from each treatment), with an average body weight of about 2.0 kg were chosen to evaluate the digestibility of nutrients for all experimental diets. Each experimental diet was fed to male ducklings for four days as a preliminary period, followed by three days collection period, where excreta was quantitatively collected. Simultaneously, records of daily feed consumption for each duckling male were maintained. The daily excreta was voided from male duckling in each

treatment, pooled and thoroughly mixed. Then, representative excreta samples were taken and dried immediately for chemical analysis *(AOAC 1995)*. The procedure described by ***Jakobsen* et *al.* *(1960)*** was used for separating fecal protein from excreta samples. Urinaly organic matter (UOM) was determined according to ***Abou-Raya and Galal (1971).*** Digestion coefficients of dry matter (DM) , organic matter (OM), crude protein (CP), crude fiber (CF) , ether extract (EE) and nitrogen free extract (NFE) as well as total digestible nutrient (TDN) and metabolizable energy (ME) were calculated according to ***(Fraps ,1946).***

Slaughter test and blood samples:

At 84 day of age, six ducklings (three males and three females) from each treatment were randomly taken for slaughter. Ducklings were fasted for 12 hours before slaughter and were individually weighed pre and after slaughter until complete bleeding. After scalding, feather picking and evisceration were performed and different body parts, organs and abdominal fat were dissected and weighed. Edible organs included heart; empty gizzard and liver were weighed. Carcass and organs weights percentage were calculated on the basis of live body weights.

During slaughter, individual blood samples were taken from birds within each treatment and collected into dry clean centrifuge tubes containing drops of heparin and centrifuged for 15 min (3500 rpm) to obtain plasma. Then, total protein ***(Peters, 1968)***, total cholesterol ***(Ellefson and Caraway, 1976)***, triglycerides ***(Bucolo and David, 1973)***, glutomic oxalacetic transaminase (GOT), glutomic pyruvic transaminase (GPT) ***(Reitman and Frankel,1957)*** and creatinine were determined by suitable commercial kits.

Statistical analysis:

Data were statistically analyzed according to SAS program ***(SAS, 2004)*** using general linear model (GLM) based on the following model ;

$$Y_{ij} = \mu + T_i + e_{ij}$$ where,

Y_{ij} = An observation, μ = Overall mean,

T_i = Effect of treatment (1, 2, ... , 4) , and e_{ij} = Random error .

Significant differences among treatments were separated by Duncan's multiple range test ***(Duncan, 1955).***

RESULTS AND DISCUSSION

Growth performance:

Results presented in Table (2) revealed no significant differences in LBW, BWG of Domyati ducklings during the experimental periods except of LBW at 56 days of age, which was significantly decreased by about 5.88 % for the group fed diet contained 18 % DDGS as compared with those fed diet contained 6 % DDGS at 56 days of age . ducklings LBW were insignificantly improved by 4.71 , 4.17 and 3.82 % for the groups fed diets contained 6 , 12 and 18 % DDGS, respectively as compared with those fed the control diet at 84 days of age.

BWG was insignificantly improved by feeding diets contained different DDGS levels during periods 29 - 56, 57 - 84 and 1 – 84 days of age as compared to the control. It was improved by about 4.73, 4.13 and 3.81 % for the groups fed diet contained 6, 12 and 18 % DDGS, respectively as compared to the control group during the whole experimental period. On other hand, BWG was slightly decreased for the groups fed diets contained 12 and 18 % DDGS as compared to the group fed 6 % DDGS during the whole experimental period.

In this respect, ***Waldroup et al. (1981)*** reported that the DDGS from beverage alcohol production was included in isocaloric broiler diets; up to 25% DDGS could be used without reduction in body weight. Also, ***Dale and Batal (2003)*** suggested a maximum level of 6% DDGS from ethanol production in starter diets and 12% in grower-finisher diets. ***Lumpkins et al. (2004)*** indicated that DDGS from modern ethanol plants was an acceptable feed ingredient for broiler diets and could be safely used at 6% in the starter period and 12 to 15% in the grower and finisher periods without any effects on growth performance. Recently, ***Noll and Brannon (2006)*** reported that performance of turkeys fed 20% DDGS was not different from the corn-soybean control. Also, ***Wang et al. (2007b)*** reported that diets containing 15% DDGS could be fed throughout the entire feeding period of 1 to 42 d of age with no adverse effects on live body weight.

Feed consumption (FC) of Domyati ducklings fed diets contained different DDGS levels during the different experimental periods was not significantly affected as compared to the control group except during period 1 – 28 days of age , which was significantly decreased by 8.85 % for the group fed diet contained 18 % DDGS as compared with those fed 6 % (Table 2). Generally, FC was insignificantly increased by 2.40, 2.78 and 1.51 % for the groups fed diet contained 6, 12 and 18 % DDGS, respectively as compared to the control group during the whole experimental period. These results are in agreement with those reported by ***Wang et al. (2007b)*** who found that feed intake did not differ significantly for birds fed diet contained 15% DDGS as compared those fed diet with no DDGS . Similarly, ***Lumpkins et al. (2004)*** reported that no significant differences in feed intake were observed by feeding 6 – 18 % DDGS in broiler diets.

Although, differences in feed conversion ratio (FCR) for ducklings fed diets containing different DDGS levels were not significant at different studied periods (Table 2), the ducklings fed diet contained 18 % DDGS had better FCR by 2.18 , 9.90 and 2.12 % than those fed control diet at the periods 1 – 28 , 57 – 84 and 1 – 84 days of age, respectively. The worse FCR values were attributed to lower BW gains and possibly higher feed consumption of the experimental ducklings at different experimental periods. In this respect, ***Wang et al. (2007b)*** reported that feed conversion ratio did not differ significantly for broiler fed diets contained 15 or 30% DDGS than those fed diets with no DDGS during 0-49 d of age. Similarly, ***Waldroup et al. (1981)*** reported that no significant differences in feed conversion were observed for broiler by feeding DDGS from beverage alcohol production up to 25 % in isocaloric diets.

Domyati ducklings grew normally, and mortality percentage of the groups fed the graded levels of DDGS up to 18 % did not differ than those fed the control diet during the whole experimental period (1-84 days). Although, all mortalities were occurred during the first brooding period (1 – 28 days). Similar results were found by ***Wang et al. (2007b)*** who reported that broiler fed diets with 15 or 30% DDGS did not differ significantly from those fed diets with no DDGS in mortality.

Nutrients digestibility:-

Percentages of ash and nitrogen retention as well as digestion coefficients of DM, OM, CP, EE, CF, NFE and nutritive value (TDN and ME) are illustrated in Table (3). No significant effects were found on ash and nitrogen retention and all digestion coefficients due to feeding diets contained different levels of DDGS. Ash and N-retention values were slightly increased by feeding diets contained different DDGS levels as compared to the control. Also, all digestibility coefficient of nutrients were

insignificantly improved by feeding diet contained different DDGS levels as compared to control. These results may be due to DDGS from the alcohol beverage industry is a valuable source of water-soluble vitamins and minerals ***(Couch et al., 1970; Jensen, 1981 and Waldroup et al., 1981)***, which affect feed metabolism. Also, DDGS is high in available nutrients, particularly lysine (***Cromwell et al., 1993; Shurson, 2003***) and a good source of P (***NRC, 1994***). In this respect, Roberts ***et al. (2007)*** reported that feeding diet contained 10 % DDGS increased the crude fiber content of diets, but did not affect DM digestibility. ***Shalash et al. (2010)*** reported that digestibility coefficient values of crude protein , crude fiber , ether extract and nitrogen free extract were not significantly affected by DDGS levels (0-20%)in laying hen diets.

Carcass characteristics:-

Results of Table (4) show no significant differences among the experimental groups in relative weights of some carcass traits for both Domyati female and male ducklings at 84 days of age except of abdominal fat which was significantly affected due to treatments. Abdominal fat percentage of both females and males was significantly increased by feeding 12 % DDGS as compared to the groups fed diet contained no (control) or 18 % DDGS, whereas, the group fed 6 % DDGS was not significantly affected as compared to the control. Eviscerated carcass, total giblets, edible parts, pancreas and spleen percentages of females and males were insignificantly increased for the groups fed diets contained different DDGS levels compared to the control group. Similar results were found by ***Wang et al. (2007a and b)*** who reported that birds fed diets contained 15 or 20% DDGS on a constant basis did not differ significantly in dressing percentage and carcass composition as compared to those fed the no DDGS diet . ***Lumpkins et al. (2004)*** reported that carcass yield was not significantly affected by feeding diets contained 6, 12, or 18% DDGS to broiler chicks through 42 days of age. Also, ***Shalash et al. (2009)*** reported that feeding diet contained 12 % DDGS had no significant effect on carcass characteristics

Blood plasma constituents:-

Results presented in Tables (5) show no significant differences between treatments regarding all studied plasma constituents for both female and male ducklings. All plasma constituents for both female and male ducklings were insignificantly increased by feeding diet contained different DDGS levels ,except of plasma total cholesterol which was decreased as compared with those fed the control diet for female ducklings only. The results demonstrate that DDGS diets did not affect the liver and kidney function under the conditions of this study, Also, these results may be due to the DDGS components such as essential oils which affect hepatic 3- hydroxy-3-methylglutaryl coenzyme A (HMG-C0A) reductase activity ***(Crowell, 1999)***; the key regulatory enzyme in cholesterol synthesis. ***Shalash et al. (2009)*** reported that plasma cholesterol, total lipids and creatinine content were not significantly affected by feeding diet contained 12 % DDGS as compared to the control. Also , ***Gabr et al. (2008)*** found that total protein , cholesterol ,GOT and GPT were not significantly affected by feeding diets contained 10 , 15 and 20 % DDGS , whereas, total lipids were significantly decreased by feeding 20 %DDGS in the diet as compared to the control.

Economic efficiency:-

Calculations were carried out according to the prices of feed ingredients, additives and live body weight prevailing during year 2010 (the experimental time) as listed in Table (6). Economic efficiency (EEF) values of growing Domyati ducklings fed diets containing DDGS during the studied growing period from one-day to 84 days of age were 0.240 , 0.298 , 0.320 and 0.355

for feeding diets containing 0 , 6 , 12 and 18 % DDGS , respectively. Relative EEF values were improved by 24.17, 33.33 and 47.92 % for the groups fed diets contained 6, 12 and 18 % DDGS, respectively as compared to the control group. Therefore, increasing inclusion corn DDGS levels seems to improve net return per duckling and economical efficiency compared to those of the control. This may be due to reducing of feedcost.

CONCLUSION

Corn distillers dried grains with solubles (DDGS) could be used in the duckling diets up to18 % without any negative effects on growth performance, digestibility coefficient of nutrients, carcass traits, and plasma constituents as well as economical efficiency of Domyati ducklings.

Table (1): Composition and calculated analysis of the experimental diets.

Ingredients %	DDGS %							
	Starter				Finisher			
	0	6	12	18	0	6	12	18
Yellow corn	61.90	58.89	55.59	52.78	68.08	65.10	62.08	59.37
Soyabean (44%)	28.80	24.65	20.00	17.00	19.01	15.98	12.29	11.00
DDGS[1]	0.00	6.00	12.00	18.00	0.00	6.00	12.00	18.00
Corn gluten (62%)	2.50	3.10	3.90	3.70	2.92	2.82	3.08	1.90
Wheat bran	3.00	3.70	4.90	5.00	6.08	6.28	6.78	6.07
Di-calcium phosphate	1.60	1.55	1.50	1.33	1.75	1.65	1.55	1.45
Limeston	1.50	1.50	1.53	1.63	1.42	1.49	1.56	1.60
Vit & Min. premix[2]	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
NaCl	0.35	0.28	0.21	0.14	0.35	0.28	0.22	0.15
DL. Methionine(99%)	0.05	0.03	0.02	0.02	0.09	0.08	0.06	0.06
Lysine Hcl (98%)	0.00	0.00	0.05	0.10	0.00	0.02	0.08	0.10
Total	100	100	100	100	100	100	100	100
Calculated Analysis[3]								
Crude protein %	20.00	20.00	20.01	20.01	17.00	17.01	17.02	17.02
ME (Kcal / kg)	2854	2854	2856	2861	2894	2896	2900	2897
Crude fiber %	3.74	4.01	4.30	4.59	3.53	3.82	4.10	4.41
Ca. %	1.01	1.01	1.01	1.01	1.00	1.01	1.01	1.01
Av.Phos. %	0.44	0.45	0.45	0.45	0.45	0.45	0.45	0.46
Lysine %	0.91	0.91	0.89	0.89	0.75	0.73	0.73	0.73
Methionine %	0.38	0.38	0.38	0.39	0.38	0.38	0.38	0.38
Met. + Cyst.	0.68	0.70	0.71	0.72	0.60	0.61	0.62	0.62
Na, %	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Price (LE/kg)[4]	2.050	1.998	1.943	1.890	1.933	1.890	1.841	1.816

1- DDGS = corn distiller's dried grains with solubles

2- Each 3 kg of the Vit and Min. premix manufactured by Agri-Vit Company, Egypt contains: Vitamin A 10 MIU, Vit. D 2 MIU, Vit E 10 g, Vit. K 2 g, Thiamin 1 g, Riboflavin 5 g, Pyridoxine 1.5 g, Niacin 30 g, Vit. B_{12} 10 mg, Pantothenic acid 10 g, Folic acid 1.5 g, Biotin 50 mg, Choline chloride 250 g, Manganese 60 g, Zinc 50 g, Iron 30 g, Copper 10 g, Iodine 1g, Selenium 0. 10 g, Cobalt 0.10 g. and carrier $CaCO_3$ to 3000 g..

3- According to NRC (1994)

4- Price of one kg (LE) at time of experiment for different ingredients : yellow corn ,1.70 ; Soy been meal, 2.80 ; DDGS ,1.60 ; corn glutine , 2.50; Wheat bran, 1.10 ; Di-calcium,3.0 ; limestone, 0.10 ; Vit&Min.,8.0 ; Nacl,0.25; Meth.,25.0 and Lys.,25.0.

Table (2): Effect of DDGS on growth performance of Domyati ducklings.

Age (days)	DDGS, %				Sig.
	0	6	12	18	
Live body weight (g)					
At hatch	37.7±1.45	39.00±1.15	40.00±1.15	39.3±0.88	NS
28 day	711.8±47.2	736.1±12.87	700.0±13.2	690.2±23.2	NS
56 day	1465.6±30.6^{ab}	1538.4±11.3^{a}	1487.0±8.5^{ab}	1447.9±19.4^{b}	0.05
84 day	2114.7±44.3	2214.2±58.4	2202.8±48.7	2195.4±85.1	NS
Body weight gain (g/28 day)					
1 - 28	674.2±45.9	697.1±14.0	660.0±14.3	650.9±24.0	NS
29 –56	753.7±16.6	802.3 ±12.5	787.0±13.2	757.7±23.4	NS
57 – 84	649.1±18.0	675.8±58.5	715.8±47.5	747.5±79.9	NS
1 – 84	2077.0±43.2	2175.2 ± 59.3	2162.8±47.7	2156.1±84.5	NS
Feed consumption (g / duckling /28 day)					
1 - 28	1856.8±16.6^{ab}	1923.5±44.1^{a}	1836.9±78.5^{ab}	1753.3±20.3^{b}	0.05
29 –56	2844.5±17.8	3014.1±99.3	2937.9±56.6	2948.1±88.1	NS
57 – 84	3148.3±88.5	3100.0±58.6	3293.3±65.7	3266.7±99.6	NS
1 – 84	7849.6±123	8037.6±188.0	8068.1±60.5	7968.1±193.0	NS
Feed conversion ratio (g feed/ g BWG)					
1 - 28	2.75±0.16	2.76±0.02	2.78±0.06	2.69±0.10	NS
29 –56	3.77±0.11	3.76±0.18	3.73±0.02	3.89±0.03	NS
57 – 84	4.85±0.10	4.59±0.29	4.60±0.20	4.37±0.33	NS
1 – 84	3.78±0.02	3.70±0.03	3.73±0.06	3.70±0.06	NS
Mortality , %					
1-84 day	3.33 ±0.83	2.50±0.0	3.33±0.83	4.17±1.67	NS

a,b,c :means in the same row bearing different superscript are significantly different ($p \leq 0.05$).
NS = not significant

Table (3): Effect of DDGS on ash and nitrogen retention and digestion coefficient of nutrients for ducklings at 70 days of age.

Parameters	DDGS, %			
	0	6	12	18
Ash retention	29.78±0.65	29.92±0.62	29.87±0.64	29.86±0.67
N – retention	62.16±0.59	62.62±0.61	62.58±0.70	62.26±0.59
Digestion coefficient ,%				
DM	65.73±0.56	66.10±0.49	66.05±0.49	65.91±0.59
OM	75.93±0.78	76.36±0.58	76.27±0.58	76.10±0.78
CP	91.18±0.60	92.05±0.96	92.00±0.99	91.28±0.58
EE	89.09±0.60	90.05±0.94	90.03±0.96	89.24±0.59
CF	27.16±0.61	27.96±0.94	27.91±0.95	27.28±0.61
NFE	79.68±0.87	79.98±0.48	79.89±0.47	79.88±0.88
TDN %	70.29±0.68	70.74±0.56	70.72±0.56	70.49±0.66
ME(Kcal/kg)	2952.0±28.3	2971.0±23.7	2970.0±23.5	2960.0±28.0

Treatment had no significant effect at ($p \leq 0.05$) all parameters.

Table (4): Effect of DDGS on carcass traits of female and male Domyati ducklings at 84 days of age.

Parameters	Sex	DDGS, %				Sig.
		0	6	12	18	
LBW (g)	F.	2020.7±80	2155.2±86	2112.8±98	2045.7±101	NS
	M.	2280.7±90	2360.2±110	2302.8±106	2295.7±98	NS
		%				
Eviscerated carcass	F.	71.94±0.32	72.69±0.12	72.73±1.43	72.29±0.34	NS
	M.	68.58±1.36	69.33±0.53	69.86±0.19	69.83±0.97	NS
Liver	F.	2.32±0.01	2.34±0.16	2.23±0.19	2.32±0.33	NS
	M.	2.36±0.14	2.34±0.33	2.62±0.18	2.39±0.26	NS
Gizzard	F.	3.38±0.25	3.67±0.32	3.80±0.31	3.81±0.07	NS
	M.	4.17±0.06	4.15±0.38	4.29±0.55	4.50±0.45	NS
Heart	F.	0.67±0.06	0.63±0.04	0.65±0.04	0.64±0.04	NS
	M.	0.69±0.05	0.75±0.02	0.72±0.01	0. 67±0.02	NS
Total giblets	F.	6.37±0.32	6.64±0.19	6.68±0.62	6.77±0.47	NS
	M.	7.22±0.27	7.24±0.19	7.63±0.71	7.86±0.54	NS
Edible part	F.	78.31±0.47	79.33±0.34	79.41±3.54	79.06±0.46	NS
	M.	75.80±1.45	76.57±0.63	77.49±0.88	77.75±1.34	NS
Spleen	F.	0.05±0.01	0.08±0.01	0.07±0.01	0.06±0.01	NS
	M.	0.06±0.01	0.07±0.01	0.08±0.03	0.08±0.01	NS
Pancreas	F.	0.44±0.05	0.52±0.04	0.53±0.04	0.50±0.03	NS
	M.	0.43±0.12	0.51±0.04	0.58±0.08	0.52±0.09	NS
Abd. fat	F.	0.52±0.12^{b}	0.93±0.05^{ab}	1.21±0.21^{a}	0.60±0.01^{b}	0.05
	M.	0.29±0.05^{b}	0.35±0.04^{ab}	0.47±0.01^{a}	0.25±0.06^{b}	0.05

F. = female, M. = male duckling
a,b :means in the same row bearing different superscript are significantly different ($P \leq 0.05$).
NS = not significant

Table (5): Effect of DDGS on plasma constituents of Domyati female and male ducklings at 84 days of age.

Parameters	Sex	DDGS, %			
		0	6	12	18
Total protein (g/dl)	F.	6.13±0.12	6.23±0.18	6.60±0.20	6.47±0.14
	M.	6.18±0.12	6.32±0.02	6.38±0.01	6.23±0.15
Triglycerides (mg/dl)	F.	197.67±3.8	198.67±2.6	206.33±3.3	214.0±15.0
	M.	208.33±9.9	221.67±6.0	218.0±10.5	210.67±16
Total cholesterol (mg/dl)	F.	197.03±3.6	195.37±8.2	189.13±5.3	179.47±2.3
	M.	184.23±4.5	192.33±17.	199.07±8.0	196.67±33.
GOT (U/dl)	F.	81.20±8.11	86.67±2.73	87.13±1.94	85.40±1.92
	M.	70.43±9.47	72.87±2.71	74.83±7.53	74.77±6.68
GPT (U/dl)	F.	17.60±3.41	20.63±1.73	22.87±7.58	23.57±1.0
	M.	26.60±4.86	26.17±2.92	26.90±3.92	26.40±6.90
Creatinine (mg/dl)	F.	0.30±0.06	0.37±0.03	0.40±0.15	0.38±0.06
	M.	0.32±0.04	0.42±0.04	0.43±0.09	0.40±0.06

F .= female , M. = male duckling
Treatment had no significant effect at ($p \leq 0.05$) all parameters.

Table (6): Effect of DDGS on economic efficiency of Domyati ducklings during 84 days of age.

Parameters	DDGS, %			
	0	6	12	18
Price of one duckling at hatch (LE)[2]	1.50	1.50	1.50	1.50
Total starter FC(kg/duck)	3.280	3.430	3.220	3.230
Cost of one kg of starter feed (LE)[2]	2.05	1.998	1.943	1.89
Total cost of starter FC(LE)	6.72	6.85	6.26	6.10
Total finisher FC(kg/duck)	4.570	4.608	4.848	4.738
Cost of one kg of finisher feed (LE)[2]	1.933	1.89	1.841	1.816
Total cost of finisher FC(LE)	8.83	8.71	8.93	8.60
Total FC (kg/duck)	7.850	8.038	8.068	7.968
Total cost of FC (LE)	15.55	15.56	15.19	14.70
Total cost per duckling (LE)	17.05	17.06	16.69	16.20
Body weight (Kg / duck)	2.115	2.214	2.203	2.195
Price of one Kg of BWG (LE)[3]	10.00	10.00	10.00	10.00
Total return (LE)	21.15	22.14	22.03	21.95
Net return (LE)	4.10	5.08	5.34	5.75
EEF[4]	0.240	0.298	0.320	0.355
Relative EEF %[5]	100	124.17	133.33	147.92

1-L.E = Egyptian pound
2-According to price of different ingredients available in Egypt at the experimental time .
3-According to local price at the experimental time .
4- EEF = economic efficiency = (Net return LE / Total feed cost LE).
5-Relative EEF = assuming EEF of the control equals 100%

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الملخـــص العربـــي

تأثيـر استخدام النواتج المجففة لتقطير الحبوب بالسوائل علـى أداء النمو في كتاكيت البط الدمياطي

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أجرى هذا البحث لدراسة تأثير إستخدام النواتج المجففة لتقطير الحبوب بالسوائل (DDGS) للأذرة بمستويات متدرجة في علائق كتاكيت البط الدمياطي على أداء النمو ومعاملات هضم العناصر الغذائية وصفات الذبيحة ومكونات الدم والكفاءة الاقتصادية . تم استخدام عدد ٤٨٠ كتكوت بط دمياطي عمر يوم واحد وزنت ووزعت عشوائيا إلى أربعة مجاميع تجريبية (١٢٠ كتكوت لكل مجموعة تجريبية) ثم وزعت كتاكيت كل مجموعة على ثلاث مكررات متساوية. احتوت عليقة البادئ والناهي على DDGS للأذرة بمستويات (صفر ، ٦ ، ١٢ ، ١٨ %) وتم تقديم العلائق البادئة من عمر يوم حتى ٤٢ يوم ثم العلائق الناهية من عمر ٤٣ يوم حتى ٨٤ يوم من العمر، وتم وزن البط على فترات (٢٨ يوم لكل فترة) من التجربة . سجل استهلاك العليقة (لكل فترة ٢٨ يوم) وخلال الفترة الكلية من ١ – ٨٤ يوم ، أيضا أجريت تجربة هضم على الذكور لتقدير معاملات الهضم للمركبات الغذائية بالعليقة ، وتم أخذ عينات دم من كتاكيت البط عند عمر ٨٤ يوم أثناء إجراء اختبار الذبح لتقدير محتوي بلازما الدم من البروتين الكلي والجلسريدات الثلاثية والكولسترول الكلي وإنزيمات الترانس أمينيز (GOT,GPT) وفي النهاية تم تقدير الكفاءة الاقتصادية للمعاملات الغذائية خلال فترة التجربة.

وبتحليل النتائج إتضح الآتي :-

- زيادة غيرمعنوية في الوزن الحي ومعدل الزيادة الوزنية للكتاكيت التي تغذت على العليقة المحتوية على مستويات مختلفة من DDGS عند نهاية التجربة (٨٤ يوم) مقارنة بالكنترول .
- لم تتأثر معنويا كمية العليقة المستهلكة لكل كتكوت بط بالمعاملات ، تحسن معامل التحويل الغذائي تحسن غير معنوى بمقدار ٢.١ % للكتاكيت التي تغذت على عليقه تحتوى على DDGS بمستوى ١٨ % مقارنة بالكنترول خلال مدة التجربة من ١ – ٨٤ يوم .
- لم يتأثر معدل النفوق للكتاكيت التي تغذت على العلائق المحتوية على DDGS بالمقارنة بالكنترول خلال فترة التجربة.
- تحسن غير معنوي في معاملات هضم العناصر الغذائية بالتغذية على العلائق المحتوية على DDGS بالمقارنة بالكنترول .
- لم تتأثر كل من صفات الدم و قياسات الذبيحة المدروسة لكل من إناث وذكور كتاكيت البط بالمعاملات التجريبية مقارنة بالكنترول .
- تحسنت الكفاءة الاقتصادية وصافى العائد لكل كتكوت بالمعاملات التجريبية مقارنة بالكنترول .

من النتائج السابقة يمكن الاستنتاج بأنه يمكن إستخدام DDGS للأذرة في علائق كتاكيت البط الدمياطي خلال فترة النمو بمستوى يصل إلى ١٨ % بدون أي تأثيرات سلبية على أداء النمو ومعاملات هضم العناصر الغذائية وصفات الدم والذبيحة والكفاءة الاقتصادية.