

EFFECT OF USING RICE BRAN IN DOMYATI DUCKLINGS DIETS ON GROWTH PERFORMANCE AND CARCASS QUALITY

By

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ABSTRACT: *A total number of 480 Domyati ducklings at one-day-old were used, weighed and divided into four treatment groups of 3 replicates each to investigate the effect of using rice bran (RB) in the diet at levels of 0, 8, 16 and 24 % on growth performance, some blood constituents, carcass characteristics and quality as well as economical efficiency during the studied growing period (one-day to 12 wks of age).*

The results indicated that RB resulted in non significant effect on live body weight (LBW), body weight gain (BWG), mortality rate (MR), feed consumption (FC) and feed conversion ratio (FCR) of ducklings from one-day to 12 weeks of age. All studied parameters of plasma constituents of both male and female ducklings were not significantly affected by different treatments with the exception of plasma triglycerides and total cholesterol. Plasma triglycerides of male ducklings were significantly ($P < 0.01$) decreased in the group fed diet contained 24 % RB only, whereas, it were significantly ($P < 0.01$) decreased in the groups fed diets contained 16 and 24 % RB in female ducklings. Plasma total cholesterol of both male and female ducklings was significantly decreased ($P < 0.05$) in the group fed diet contained 24 % RB as compared to the control group. Carcass characteristics and quality were not significantly affected by different treatments with the exception of ether extract and total cholesterol content of both male and female duckling muscle which were significantly ($P \leq 0.01$) decreased by feeding RB at levels of 16 and 24 % as compared to the control group. The experimental treatments resulted in improvement net return and economical efficiency. These results indicated that RB could be used in ducklings diets up to 24 % to maximize the productivity and profitability in addition to the carcass quality and economical efficiency of Domyati ducklings.

INTRODUCTION

Low-cost duck production relies heavily on low-cost ingredients. These are often agricultural waste-products and by-products. Rice bran is used to describe the by-product remaining after the milling of brown rice to give white rice. It is rich in protein, lipids, vitamins B and E, and trace minerals (Saunders, 1986 and Warren and Farrell, 1990). Rice bran compares favorably with other cereal bran's in amino acid composition (Farrell, 1994). Many successful trials have been reported on using rice bran in layers and ducklings diets (Ghazalah *et al.*, 1990 and Farrell, 1994).

The world's duck population is increasing steadily and is much interest because of their unusual qualities and its remarkable ability to glean and subsist on feeding materials that are not retrievable by chickens, turkeys or other domestic animals, the duck does not compete with man for food to extent that other animals do. This is an extremely important point because future predictions for poultry production in Egypt indicate a need for high-quality raw feed ingredients that is unlikely to be met. Ducks can cope with feedingstuffs high in fiber such as rice bran (Farrell, 1994) because they do not have a distinct diverticulum and the crop corresponds to a widening of the esophagus (Moran, 1976).

Domyati ducks are a local breed of ducks in Egypt. Ducks had gradually increased attention in the last two decades in Egypt for production of meat and hatching eggs. The objective of this study aimed to investigate the effect of feeding Domyati ducklings diets containing different levels of rice bran on their growth performance, some blood constituents and carcass quality taken in consideration the economical efficiency during the growth period.

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, Egypt. It was started in March and terminated in June 2008. Four hundred and eighty unsexed Domyati ducklings one-day old were used, weighed and distributed into four experimental groups without significant differences in their average weights. Each group contained 120 ducklings and equally subdivided into 3 replicates (of 40 birds each). Ducklings were reared under similar hygienic and managerial conditions. They were housed in well ventilated brooding pens (3.4 x 8.6 m) from one-day up to 3 weeks of age. Wheat straw was used as a litter throughout the experimental period. At the end of brooding period the

ducklings were permitted to go to out yards . Feed and fresh water were available all the time. Ducklings were fed starter diets up to 4 weeks and grower diets from 5 to 12 wks of age . Four diets of both starter and grower were formulated to contain rice bran (RB) at levels of 0 , 8 , 16 and 24 % , and were fed as one to each of the four experimental groups. The composition and calculated analysis of the experimental diets are presented in Table (1).

Data collection : Live body weight (LBW) of ducklings was recorded at one-day , 4 , 8 and 12 weeks of age. Feed consumption (FC) of each replicate and mortality for all treatments were weekly recorded. Body weight gain (BWG) and feed conversion ratio (FCR) during the same periods were calculated.

Slaughter test: At the end of 12 wks of age, totally six birds per treatment group (one male and one female from each replicate) were randomly taken for slaughtering. Ducks were fasted for 12 hours and taken individually weighed pre and after slaughtering . Presently after scalding, feather picking and evisceration were performed and different body parts , organs and abdominal fat were dissected and weighed .Then , skinless-boneless pooled samples from breast and thigh muscles were taken and chemically analyzed for dry matter (DM), crude protein (CP), ether extract (EE), and ash according to AOAC (1995) and the values were expressed on DM basis .The samples from the same muscles were chopped, minced and frozen at - 20 C until further total cholesterol analyses. After thawing, the total lipid was extracted from the muscle samples according to the method of Folch *et al.*(1957) and the total muscle cholesterol was estimated by one-step method of Wybenga *et al.* (1970).

Blood samples : During slaughtering , blood samples were collected in heparinized test tubes and centrifuged at 3500 rpm for 15 minutes to obtain blood plasma .Then plasma glucose (Trinder, 1969) , total protein (Peters , 1968) , total cholesterol (Ellefson and Caraway , 1976) , triglycerides (Bucolo and David, 1973) and transaminase enzymes activities ALT and AST (Reitman and Frankel,1957) were determined.

Statistical analysis : Data was statistically analyzed according to SAS program (SAS Institute, Inc., 1994) 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. The significant differences among treatments were determined 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 and mortality rate (MR) of Domyati ducklings during the experimental periods. Live body weight was insignificantly improved by about 3.99, 6.16 and 3.88 % at 4, 8 and 12 wks of age, respectively at 8 % RB as compared to the control group. Whereas, the groups fed diets contained 16 and 24 % RB were approximately equal in their live body weights to the control group at 8 and 12 wks of age. Similarly, several investigators (Zanuddin *et al.*, 1985, Annison *et al.*, 1995 and Adrizal *et al.*, 1996) found no differences in LBW between broilers fed a corn basal diet and those fed the basal diet containing 20% RB. Also, LBW did not differ significantly for broilers fed diet contained 15 % RB as compared to those fed the control diet (El-Full *et al.*, 2000).

Body weight gain was insignificantly improved by about 4.13, 8.77 and 3.95 % of the group fed diet contained 8 % RB during experimental periods 0 - 4, 4 - 8 and 0 - 12 wks of age, respectively as compared to the control group. Whereas, there was a slight increase in BWG for the groups fed diets contained 16 and 24 % RB as compared to the control group during the experimental periods with the exception of the period 0 - 4 wks of age. This may be due to RB effects nutritional status, vitamins and minerals, level of dietary fat and cholesterol, and hormonal factors which could affect on growth. Similar results were found by Piliang *et al.* (1982) and Farrell and Martin (1998) who indicated that feeding broiler chickens on diet containing 20% RB did not depress BWG.

Domyati ducklings grew normally, and MR of the groups fed the graded levels of RB up to 24% did not differ than those fed the control diet during experimental period (0-12 wks). All mortalities were occurred during the first incubation period (0 - 4 wks of age). This may be due to that the Domyati ducklings have the ability to tolerate the studied levels of RB in the diets. Similar results were found by Piliang *et al.* (1982) and Gallinger *et al.* (2004) who reported no negative effects of feeding inclusion level of RB up to 25 % on the viability.

Data of FC and FCR of Domyati ducklings fed diets contained RB at different levels during the experimental periods are presented in Table (3).

The data revealed that no significant differences were observed among the experimental groups in these parameters. These results may be due to the diets which were isocaloric and isonitrogenous of all experimental groups, and may be also, the ducklings are supplied their requirements of different dietary nutrients rather than increasing feed consumption . These findings are similar to those of **Farrell and Martin (1998)** and **Gallinger *et al.*(2004)** who reported no significant effect of both FC and FCR by increasing rates of RB up to 10 - 20% in the broiler diets.

Blood plasma parameters:-

Plasma parameters of Domyati ducklings, measured in the present study, were estimated to show the metabolic status of ducks and their health as affected by feeding dietary levels of RB. Results presented in Tables (4 and 5) show no significant differences between treatments regarding all studied plasma constituents with the exception of plasma triglycerides and total cholesterol which were significantly affected. Plasma triglycerides values of male ducklings were significantly ($P \leq 0.01$) decreased by 39.71 % in the group fed diet contained 24 % RB, whereas, in female ducklings it were significantly ($P \leq 0.01$) decreased by 19.81 and 33.02 % in the groups fed diets contained 16 and 24 % RB, respectively, as compared to the control group. Plasma total cholesterol value of both male and female ducklings was significantly lowered ($P \leq 0.05$) by 14.14 and 13.80 % in the group fed diet contained 24 % RB, respectively as compared to the control group. Whereas, it was insignificantly decreased by feeding diets contained 8 and 16 % RB as compared to the control group. Plasma glucose, AST and ALT values of both male and female ducklings were insignificantly affected by different treatments. The reduction in plasma triglycerides and total cholesterol of both male and female ducklings fed diets contained RB could be attributed to the characteristic composition of RB including soluble fiber, polyunsaturated fatty acids and some active components which could inhibit hydroxymethyl glutaryl coenzyme A (HMG-Co A) reductase activity, thus decreasing cholesterol synthesis (**Hegsted and Kousik, 1994**).

The results of this study are in agreement with those reported by **Rouanet *et al.* (1993)** and **Hegsted and Kousik (1994)** who noticed that feeding rats on crude RB lowered total cholesterol in comparison with wheat bran and tended to decrease triglycerides and this was mainly attributed to its high soluble fiber content. Similarly, **Sharara *et al.*(2003)** noticed that the broiler fed diets containing 10 % RB had low cholesterol concentration in blood serum. **Awad *et al.*(2008)** reported that plasma

triglycerides and total cholesterol were significantly decreased in laying ducks fed diet containing 16 and 24 % RB compared to the control .

Carcass characteristics:-

Results of Tables (6 and 7) show no significant differences between the experimental groups in relative weight of some carcass traits for both Domyati male and female ducklings at 12 wks of age. Dressed carcass, giblets, edible parts and abdominal fat percentages were insignificantly decreased for the groups fed diets contained RB at different levels compared to the control group. These results may be due to increasing dietary fiber gradually when RB increased in the diet and the percentage of saturated fatty acids are less in rice bran oil compared to mono and polyunsaturated fatty acids which resulted in decreasing the fat deposition in adipose tissue . These results agree with the findings of *Zanuddin et al. (1985)* who reported that there were insignificant differences in carcass yield between chicks fed RB as substitute for yellow corn at levels of 20, 40, 60 and 80% and those fed the control diet. *El-Full et al.(2000)* reported that feeding rice bran as substitute for yellow corn in broiler diets up to 100 % did not significantly affect dressed carcass, abdominal fat, gizzard and heart. Also, *Majun and Payne (1977)*, *Sayre et al. (1988)* and *Adrizal et al. (1996)* reported that RB had no effect on liver or gizzard percentages.

Carcass quality:

Data of muscles composition and total cholesterol content of both Domyati male and female ducklings due to treatments are presented in Tables (8 and 9).The results revealed that no significant differences were observed for DM , CP and CA, whereas, EE and total cholesterol were significantly affected. Ether extract values of breast muscle of male ducklings were significantly ($P \leq 0.05$) decreased by about 14.98 and 20.36 % ,whereas , it were 13.03 and 17.30 % in female ducklings in the groups fed diets contained 16 and 24 % RB , respectively as compared to the control group. Also, ether extract values of thigh muscle of Domyati male ducklings were significantly ($P \leq 0.01$) decreased by about 10.06 and 14.72 % in the groups fed diets contained 16 and 24 % RB , respectively as compared to the control group, whereas , it were significant ($P \leq 0.05$) decrease by about 13.67% in thigh muscle of female ducklings fed diet contained 24 % RB only as compared to the control group. Breast and thigh muscle ash in both males and females was insignificantly increased in the groups fed diets contained 8 to 24 % RB.

Total cholesterol values in both breast and thigh muscle of male and female ducklings were significantly ($P \leq 0.01$) decreased by treatments .

The decreasing value in male breast muscle was 12.37 , 23.07 and 30.60% in the groups fed diets contained 8 , 16 and 24 % RB , respectively as compared to the control group, whereas , it was 24.30 and 32.37 % in male thigh muscle in the groups fed diets contained 16 and 24 %RB, respectively. Also, the decreasing value of total cholesterol in female breast muscle was 17.14 and 29.05% , whereas, it was 21.83 and 28.67 % in female thigh muscle, respectively in the groups fed diets contained 16 and 24 % RB as compared to control group. The decrease in the breast and thigh muscle ether extract and total cholesterol level may be due to the composition of rice bran oil which contain more short and medium chain fatty acids which can be convert into energy needed for exercise of muscle. In this respect, **Hargis (1988)** reported that fiber influences cholesterol metabolism of laying hen by decreasing absorption of cholesterol, binding with the bile salts in the intestinal tract, shortening intestinal transit time and increasing fecal sterol excretion. Also, **Hegsted and Kousik (1994)** and **Goffman et al.(2003)** reported that RB content active components (γ -oryzanol, tocopherols, tocotrienols, phytosterols, polyphenols and squalene) which can inhibit hydroxymethyl glutaryl coenzyme A (HMG-CoA) reductase activity, thus decreasing cholesterol synthesis .

Economic efficiency:-

Calculations were carried out according to the prices of feed ingredients, additives and live body weight prevailing during year 2008 (the experimental time) as listed in Table (10). The economic efficiency (EEF) values of growing Domyati ducklings fed diets containing RB during the studied growing period from one-day to 12 weeks of age were 0.384 , 0.458 , 0.485 and 0.505 as feeding diets containing 0, 8 , 16 and 24 % RB , respectively. Relative EEF values were improved by 19.27, 26.30 and 31.51 % for the groups fed diets contained 8, 16 and 24 % RB, respectively as compared to the control group. So, increasing inclusion levels of RB seem to improve net return per duckling and economical efficiency compared to those of the control. This may be due to the decreasing of feed cost. These results are in agreement with the findings of **Khalil et al. (1997)** who reported that using of RB in broiler diets reduced feed cost per kilogram body weight gain. Also, **Awad et al.(2008)** reported that increasing level of RB in laying duck diets up to 24 % reduced feed cost and improved economic efficiency.

CONCLUSION

Since , the best results in most studied traits were recorded for the groups fed diets contained rice bran at levels 16 and 24 % therefore, it could be that rice bran could be used in growing duck diets at levels up to 24 % to maximize the productivity , profitability, carcass quality and economical efficiency of Domyati ducklings.

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

Ingredients %	Starter				Grower			
Yellow Corn	64.30	57.30	50.30	43.30	71.00	64.00	57.00	50.00
Soyabean meal (44 %)	32.00	31.00	30.00	29.00	25.00	24.00	23.00	22.00
Rice bran	0.00	8.00	16.00	24.00	0.00	8.00	16.00	24.00
Di-calcium phosphate	1.40	1.40	1.40	1.40	1.60	1.60	1.60	1.60
Limestone	1.50	1.50	1.50	1.50	1.60	1.60	1.60	1.60
Vit & Min. premix*	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
NaCl	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
DL. Methionine	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Total	100	100	100	100	100	100	100	100
Calculated Analysis **								
Crude protein %	19.74	19.74	19.73	19.73	17.23	17.23	17.22	17.22
ME (Kcal / kg)	2876	2865	2856	2846	2944	2934	2924	2914
Ether extract . %	2.70	3.47	4.23	5.00	2.90	3.66	4.43	5.20
Crude fiber %	3.72	4.40	5.08	5.82	3.38	4.06	4.75	5.43
Calcium (%)	0.99	0.99	0.99	0.99	1.05	1.05	1.05	1.05
Av. phosphorus (%)	0.40	0.41	0.42	0.43	0.43	0.43	0.44	0.45
Lysine %	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Methionine %	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Methio + Cyst %	0.77	0.76	0.76	0.75	0.77	0.76	0.76	0.75

*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. B₁₂ 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 CaCO₃ to 3000 g..

** According to NRC (1994)

Table (2) Effect of rice bran on live body weight , body weight gain and mortality rate (Means* ±SE) of Domyati ducklings during experimental periods.

Age wks	Rice bran %			
	0	8	16	24
LBW (g/duck)				
One-day	46.7±1.5	47.0±1.2	50.0±1.0	47.7±0.9
4	1003.3±8.8	1043.3±14.5	993.3±27.3	973.3±24.0
8	1840.0±41.6	1953.3±33.8	1870.0±32.1	1823.3±63.3
12	2663.3±21.9	2766.6±46.6	2736.6±94.0	2676.6±56.6
BWG (g/ duck / day)				
0 - 4	34.17±0.30	35.58±0.56	33.69±0.97	33.06±0.85
4 - 8	29.88±1.37	32.50±1.61	31.31±1.21	30.36±1.61
8 - 12	29.40±1.76	29.05±0.52	30.95±2.46	30.48±1.72
Overall mean	31.15±0.24	32.38±0.54	31.99±1.13	31.30±0.67
MR %				
0 - 12	6.67±1.67	5.00±2.50	5.83±0.83	8.33±0.83

* No significant differences were observed among treatments in all parameters studied.

Table (3) Effect of rice bran on feed consumption and conversion ratio (Means* ±SE) of Domyati ducklings during experimental period.

Age wks	Rice bran %			
	0	8	16	24
FC (g/duck/ day)				
0 - 4	71.3±4.9	69.7±2.3	68.7±1.8	67.0±1.5
5 - 8	124.3±1.8	126.7±2.4	128.0±1.2	126.7±4.4
8 - 12	122.0±3.1	127.0±4.4	124.3±2.9	121.3±3.8
Overall mean	105.9±2.2	107.8±1.9	107.0±0.3	105.0±1.5
FCR (g feed / g BWG)				
0 - 4	2.09±0.15	1.96±0.10	2.04±0.05	2.03±0.09
5 - 8	4.16±0.15	3.92±0.25	4.09±0.18	4.17±0.14
8 - 12	4.17±0.14	4.37±0.20	4.06±0.26	4.00±0.24
Overall mean	3.39±0.06	3.33±0.10	3.36±0.12	3.36±0.13

* No significant differences were observed among treatments in all parameters studied.

Table (4) : Effect of rice bran on plasma constituents (Means \pm SE) of Domyati male ducklings at 12 wks of age.

Items	Rice bran %				Sig
	0	8	16	24	
Total protein g/dl	4.07 \pm 0.10	4.07 \pm 0.26	4.13 \pm 0.18	4.09 \pm 0.19	NS
Triglycerid. mg /dl	104.0 \pm 12.7 ^a	103.3 \pm 4.2 ^a	87.0 \pm 4.2 ^{ab}	62.7 \pm 6.8 ^b	0.01
Total cholesterol mg/dl	198.0 \pm 4.6 ^a	193.0 \pm 3.5 ^a	186.3 \pm 5.2 ^a	170.0 \pm 4.0 ^b	0.05
Glucose mg/dl	135.3 \pm 5.5	133.3 \pm 4.1	132.7 \pm 5.8	129.7 \pm 11.2	NS
AST U/L	58.3 \pm 4.0	62.0 \pm 5.1	62.7 \pm 4.8	65.7 \pm 5.2	NS
ALT U/L	28.3 \pm 0.5	29.4 \pm 0.8	29.1 \pm 0.6	30.2 \pm 0.8	NS

a,b :means in the same row bearing different superscript are significantly different ($P \leq 0.05$).

NS = not significant

Table (5): Effect of rice bran on plasma constituents (Means \pm SE) of Domyati female ducklings at 12 wks of age.

Items	Rice bran %				Sig.
	0	8	16	24	
Total protein g/dl	4.30 \pm 0.17	4.13 \pm 0.15	4.21 \pm 0.21	4.13 \pm 0.42	NS
Triglycerid. mg /dl	106.0 \pm 5.8 ^a	97.0 \pm 4.0 ^{ab}	85.0 \pm 3.5 ^{bc}	71.0 \pm 5.2 ^c	0.01
Total cholesterol mg/dl	208.0 \pm 6.4 ^a	201.3 \pm 5.2 ^a	192.0 \pm 5.8 ^{ab}	179.3 \pm 6.8 ^b	0.05
Glucose mg/dl	136.3 \pm 10.3	135.3 \pm 7.2	134.3 \pm 20.2	132.0 \pm 7.6	NS
AST U/L	61.0 \pm 2.3	63.0 \pm 2.9	63.9 \pm 3.2	64.3 \pm 3.5	NS
ALT U/L	22.0 \pm 2.8	23.9 \pm 1.7	24.4 \pm 3.1	25.1 \pm 4.3	NS

a,b,c :means in the same row bearing different superscript are significantly different ($P \leq 0.05$).

NS = not significant

Table (6) Effect of rice bran on relative weight of carcass parts (Means \pm SE) of Domyati male ducklings at 12 wks of age.

Items	Rice bran %			
	0	8	16	24
LBW (g)	2857 \pm 76	2913 \pm 150	2927 \pm 38	2783 \pm 147
%				
Dressed carcass	70.61 \pm 1.80	69.81 \pm 0.51	70.07 \pm 1.07	70.27 \pm 0.88
Liver	1.76 \pm 0.10	1.71 \pm 0.07	1.78 \pm 0.20	1.97 \pm 0.90
Gizzard	3.29 \pm 0.03	2.95 \pm 0.07	3.00 \pm 0.26	3.03 \pm 0.09
Heart	0.62 \pm 0.05	0.65 \pm 0.10	0.72 \pm 0.06	0.64 \pm 0.05
Giblets	5.67 \pm 0.08	5.31 \pm 0.04	5.50 \pm 0.52	5.64 \pm 0.13
Head	2.63 \pm 0.13	3.47 \pm 0.33	3.30 \pm 0.04	2.83 \pm 0.11
Edible parts	78.91 \pm 1.87	78.59 \pm 0.54	78.87 \pm 1.22	78.74 \pm 0.93
Abdominal fat	0.97 \pm 0.12	0.87 \pm 0.16	0.85 \pm 0.40	0.85 \pm 0.12

* No significant differences were observed among treatments in all parameters studied.

Table (7) Effect of rice bran on relative weight of carcass parts (Means \pm SE) of Domyati female ducklings at 12 wks of age.

Items	Rice bran %			
	0	8	16	24
LBW (g)	2287 \pm 67	2398 \pm 60	2337 \pm 163	2357 \pm 47
%				
Dressed carcass	68.35 \pm 0.15	67.83 \pm 0.39	68.06 \pm 1.23	68.03 \pm 0.23
Liver	1.95 \pm 0.18	2.02 \pm 0.16	1.83 \pm 0.06	1.90 \pm 0.12
Gizzard	2.96 \pm 0.08	3.01 \pm 0.33	3.05 \pm 0.34	3.00 \pm 0.26
Heart	0.78 \pm 0.07	0.64 \pm 0.01	0.65 \pm 0.06	0.68 \pm 0.03
Giblets	5.69 \pm 0.31	5.67 \pm 0.15	5.53 \pm 0.37	5.58 \pm 0.23
Head	2.56 \pm 0.04	2.71 \pm 0.13	2.82 \pm 0.27	2.77 \pm 0.09
Edible parts	76.60 \pm 0.39	76.21 \pm 0.50	76.41 \pm 0.87	76.39 \pm 0.44
Abdominal fat	1.08 \pm 0.20	1.02 \pm 0.08	0.98 \pm 0.30	0.91 \pm 0.13

* No significant differences were observed among treatments in all parameters studied.

Giblets % = liver % + gizzard % + heart %

Dressed carcass % = total carcass (without head , legs, abdominal fat, viscera and hnges) as percent of live body weight

Edible parts % = dressed carcass % + giblets % + head %

Table (8) Effect of rice bran on muscle composition and total cholesterol content (Means \pm SE) of Domyati male ducklings at 12 wks of age.

Items	Rice bran %				Sig.
	0	8	16	24	
Dry matter %					
Breast	26.70 \pm 0.64	26.37 \pm 0.72	26.33 \pm 0.56	26.52 \pm 0.51	NS
Thigh	25.69 \pm 0.67	25.63 \pm 0.14	25.58 \pm 0.29	25.20 \pm 0.68	NS
Overall mean	26.20 \pm 0.41	26.00 \pm 0.37	25.96 \pm 0.31	25.86 \pm 0.41	NS
Crude protein %					
Breast	79.08 \pm 0.88	79.86 \pm 0.70	79.63 \pm 0.56	79.96 \pm 0.90	NS
Thigh	78.05 \pm 1.22	78.28 \pm 1.37	78.53 \pm 1.49	78.90 \pm 1.10	NS
Overall mean	78.57 \pm 0.78	79.07 \pm 0.77	79.08 \pm 0.75	79.43 \pm 0.68	NS
Ether extract %					
Breast	16.55 \pm 0.7 ^a	14.48 \pm 0.8 ^{ab}	14.07 \pm 0.9 ^b	13.18 \pm 0.4 ^b	0.05
Thigh	18.68 \pm 0.44 ^a	18.32 \pm 0.49 ^{ab}	16.80 \pm 0.60 ^{bc}	15.93 \pm 0.69 ^c	0.01
Overall mean	17.62 \pm 0.60 ^a	16.40 \pm 0.96 ^{ab}	15.44 \pm 0.78 ^b	14.56 \pm 0.71 ^b	0.05
Ash %					
Breast	3.19 \pm 0.11	3.21 \pm 0.09	3.28 \pm 0.12	3.35 \pm 0.18	NS
Thigh	2.14 \pm 0.20	2.24 \pm 0.15	2.36 \pm 0.21	2.43 \pm 0.23	NS
Overall mean	2.67 \pm 0.24 ^c	2.73 \pm 0.22	2.82 \pm 0.21	2.89 \pm 0.20	NS
Total cholesterol (mg/100 g wet muscle)					
Breast	245.7 \pm 8.1 ^a	215.3 \pm 8.1 ^b	189.0 \pm 5.8 ^c	170.5 \pm 5.8 ^c	0.01
Thigh	219.3 \pm 12.3 ^a	195.0 \pm 9.0 ^{ab}	166.0 \pm 7.6 ^{bc}	148.3 \pm 12.8 ^c	0.01
Overall mean	232.5 \pm 8.8 ^a	205.2 \pm 7.1 ^b	177.5 \pm 5.2 ^c	159.4 \pm 8.0 ^c	0.01

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

Table (9) Effect of rice bran on muscle composition and total cholesterol content (Means \pm SE) of Domyati female ducklings at 12 wks of age.

Items	Rice bran %				Sig.
	0	8	16	24	
Dry matter %					
Breast	26.82 \pm 0.28	26.80 \pm 0.92	26.63 \pm 0.59	26.77 \pm 0.73	NS
Thigh	25.60 \pm 0.49	25.26 \pm 0.30	25.70 \pm 0.49	25.49 \pm 0.84	NS
Overall mean	26.21 \pm 0.47	26.03 \pm 0.37	26.17 \pm 0.31	26.13 \pm 0.42	NS
Crude protein %					
Breast	77.03 \pm 0.46	77.70 \pm 0.60	77.84 \pm 0.55	78.13 \pm 0.61	NS
Thigh	75.87 \pm 0.81	76.27 \pm 0.45	76.54 \pm 0.55	76.57 \pm 0.75	NS
Overall mean	76.45 \pm 0.49	76.99 \pm 0.46	77.19 \pm 0.46	77.35 \pm 0.36	NS
Ether extract %					
Breast	18.03 \pm 0.70 ^a	16.50 \pm 0.8 ^{ab}	15.68 \pm 0.59 ^b	14.91 \pm 0.51 ^b	0.05
Thigh	20.04 \pm 0.81 ^a	19.63 \pm 0.75 ^a	18.14 \pm 0.50 ^{ab}	17.30 \pm 0.56 ^b	0.05
Overall mean	19.04 \pm 0.66 ^a	18.07 \pm 0.85 ^{ab}	16.91 \pm 0.65 ^b	16.11 \pm 0.63 ^b	0.05
Ash %					
Breast	2.98 \pm 0.35	3.17 \pm 0.33	3.41 \pm 0.33	3.47 \pm 0.29	NS
Thigh	2.04 \pm 0.20	2.03 \pm 0.15	2.19 \pm 0.30	2.34 \pm 0.35	NS
Overall mean	2.51 \pm 0.16	2.60 \pm 0.27	2.80 \pm 0.73	2.91 \pm 0.28	NS
Total cholesterol (mg/100 g wet muscle)					
Breast	221.7 \pm 4.4 ^a	208.3 \pm 7.9 ^a	183.7 \pm 4.5 ^b	157.3 \pm 7.2 ^c	0.01
Thigh	204.7 \pm 10.3 ^a	188.3 \pm 8.7 ^a	160.0 \pm 7.9 ^b	146.0 \pm 5.1 ^b	0.01
Overall mean	213.2 \pm 6.3 ^a	198.3 \pm 6.2 ^a	171.9 \pm 6.7 ^b	152.7 \pm 4.5 ^c	0.01

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

Table (10): Effect of rice bran on economical efficiency of growing Domyati ducklings during 12 wks of age .

Parameters	Rice bran, %			
	0	8	16	24
Average feed consumption kg / duckling during starter period	1.996	1.952	1.924	1.876
Cost / kg starter diet , L.E ¹	1.995	1.944	1.893	1.841
Average feed consumption kg / duckling during grower period	6.896	7.103	7.064	6.943
Cost / kg grower diet , L.E ¹	1.938	1.886	1.835	1.783
Total feed cost , L.E ¹	17.35	17.19	16.60	15.83
Duckling price , L.E ²	1.50	1.50	1.50	1.50
Average cost from mortality / duckling , L.E ³	0.39	0.28	0.32	0.45
Total cost / duck , L.E ⁴	19.24	18.97	18.42	17.78
Average BW at 12 wks , kg	2.663	2.766	2.736	2.676
Price of one kg body weight , L.E ²	10.0	10.0	10.0	10.0
Total return /duck , LE	26.63	27.66	27.36	26.76
Net return / duck . LE	7.39	8.69	8.94	8.98
EEF ⁴	0.384	0.458	0.485	0.505
Relative EEF ⁵	100	119.27	126.30	131.51

L.E = Egyptian pound

1-According to price of different ingredients available in Egypt at the experimental time (2008) .

2-According to local price at the experimental time .

3- price of dead duckling number+ feed consumption cost of them during 0-4 wks / live duckling number.

4- EEF = economic efficiency = (Net return LE / Total cost LE) . 5-Relative EEF = assuming EEF of the control equals 100%

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الملخص العربي

تأثير استخدام رجيع الكون في علائق كتاكيت البط الدمياطي على أداء النمو وجودة الذبيحة

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أجرى هذا البحث لدراسة تأثير استخدام رجيع الكون بمستويات متدرجة في علائق كتاكيت البط الدمياطي خلال فترة النمو على أداء النمو وصفات الذبيحة وتركيبها الكيماوي وبعض صفات الدم والكفاءة الاقتصادية. تم استخدام عدد ٤٨٠ كتكوت بط دمياطي عمر يوم تم وزنهم و تقسيمهم إلى أربعة مجاميع تجريبية وبكل مجموعة ثلاث مكررات. تم تكوين العلائق التجريبية الأربعة المحتوية على رجيع الكون بمستويات (صفر، ٨، ١٦، ٢٤ %) وتم تقديمها للمجموعات التجريبية الأربعة خلال فترة التجربة (عمر يوم - ١٢ أسبوع)، وتم وزن الكتاكيت في بداية التجربة ثم كل أربعة أسابيع حتى نهاية التجربة كما سجل استهلاك العليقة وعدد النافق خلال مدة التجربة ، وتم أخذ عينات دم من كتاكيت البط للذكور والإناث عند عمر ١٢ أسبوع أثناء إجراء اختبار الذبح لتقدير محتويات بلازما الدم من البروتين الكلي والجلسريدات الثلاثية والكوليسترول الكلي والجلوكوز وإنزيمات الترانس أمينيز (AST,ALT) وأخذت عينات اللحم من الصدر والفخذ لإجراء التحليل الكيماوي لها وفي النهاية تم تقدير الكفاءة الاقتصادية للمعاملات الغذائية خلال فترة النمو.

وبتحليل النتائج اتضح الآتي :-

لم يتأثر معنويا وزن الجسم الحي ومعدل الزيادة في وزن الجسم للكتاكيت ، معدل النفوق ، كمية العليقة المستهلكة والكفاءة التحويلية بالمعاملات الغذائية المختلفة . لم تتأثر صفات الدم المدروسة معنويا بالمعاملات فيما عدا محتوى البلازما من الجلسريدات الثلاثية والكوليسترول الكلي والتي انخفضت معنويا للمجموعات التي تغذت على عليقه تحتوي على رجيع كون بمستوى ١٦ و ٢٤ % في الإناث بالمقارنة بالكنترول بينما في الذكور انخفضت معنويا للمجموعة التي تغذت على عليقه تحتوي على رجيع كون بمستوى ٢٤ % فقط . لم تتأثر معنويا قياسات الذبيحة المدروسة بالمعاملات التجريبية مقارنة بالكنترول . انخفضت قيم الجلسريدات الثلاثية و الكوليسترول الكلي معنويا في لحم كل من الذكور والإناث للمجموعات التي تغذت على عليقه تحتوي على ١٦ و ٢٤ % رجيع كون بالمقارنة بالكنترول . تحسنت الكفاءة الاقتصادية وصافي العائد لكل بطة بالمعاملات التجريبية مقارنة بالكنترول .

من النتائج السابقة يمكن الاستنتاج بأن استخدام رجيع الكون في علائق كتاكيت البط في فترة النمو بمستوى يصل إلى ٢٤ % يمكن أن يؤدي إلى تحسن في مقاييس الأداء الإنتاجي للنمو وجودة الذبيحة والكفاءة الاقتصادية وبدون أي تأثير معاكس على هذه المقاييس.