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EFFECT OF USING RICE BRAN IN DUCK DIETS ON: 1 - LAYING PERFORMANCE AND HATCHABILITY TRAITS OF DOMYATI DUCKS

By

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ABSTRACT : *A total number of 180 Domyati ducks 26 weeks-old were selected, 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 % from 26 until 41 weeks of age on laying performance parameters , semen quality , nutrients digestibility, chemical analyses as well as quality of eggs, fertility and hatchability percentages, some blood constituents, carcass characteristics and economical efficiency during the studied laying period (26-41 wks).*

The results indicated that rice bran resulted in insignificant effect on body weight change and mortality rate of ducks from 26 to 41 weeks of age . Egg number, egg mass per duck and laying rate were significantly ($P \leq 0.01$) improved for the group fed diet contained RB at 24 % as compared to those of the control during the overall experimental period (26-41 wks). Egg weights were slightly increased during the overall experimental period due to treatments. Records of feed consumption per duck were not significantly affected during the experimental period due to treatments. Feed conversion (g feed / g egg mass) values were significantly ($P \leq 0.01$) improved of groups fed diets contained RB at levels of 16 and 24 % as compared to that of the control. Semen quality traits were not affected significantly by feeding diets contained RB with the exception of semen concentration which significantly ($P \leq 0.05$) decreased. Ash and nitrogen retained, CP and EE digestibility were significantly ($P \leq 0.01$) improved by feeding diet contained RB at 24 % as compared to the control group. Egg chemical components and quality measurements were not significantly affected by feeding diets contained RB as compared to the control. Fertility and hatchability of setting eggs were insignificantly improved for the group fed diet contained RB at 24 % as compared to the control. Also, early embryonic mortality percentages were decreased for groups fed diets contained RB at levels of 16 and 24 % as compared to the control. All

studied parameters of blood plasma constituents were not significantly affected with the exception of plasma triglycerides , total cholesterol and glucose which were significantly decreased (P<0.01) for groups fed diets contained RB at levels of 16 and 24 % as compared to the control. Carcass traits were not significantlyaffected due to the treatments . The experimental treatments resultedin clear improving of net return per duck and economical efficiency. These results indicated that RB could be used in laying duck diets up to 24 % to maximize the productivity and profitability in addition to the hatchability traits and economical efficiency of Domyati ducks.

INTRODUCTION

Increasing price of feedstuffs used for poultry feeding imposes nutritionists to lookfor new cheaper feedstuffs able to replace the traditional and more expensive ingredients like corn and soybean meal. Rice bran is a major cereal by-product , which is widely used in rice-producing countries as a feed ingredient in animal diets . It contains a suitable content of protein (13.2 to 17.13%), fat (14.0 to 22.9%), carbohydrate (16.1 to 21.25%), fiber (9.5 to 13.2%), and vitamins and minerals **(Vargasgonzalez, 1995; Aljasser and Mustafa, 1996; Ambashankar and Chandrasekaran, 1998)**. Because rice bran is relatively less expensive than corn ,its feeding value has been investigated in poultry **(Warren and Farrell, 1990 ; Ghazalah *et al.*,1990 and Zeweil *et al.*, 2005)**. Rice bran may be included in small amounts in broiler diets and higher amounts in layer diets without adverse effects on production **(Farrell and Martin,1998)**.

In a 5 year period (2002 to 2007), Egypt produced an average of 8-10 million tons of rice annually. Rice bran is a powdery fine, fluffy material that consists of seeds or kernels, in addition to particles of pericarp, seed coat, aleurone, germ and fine starchy endosperm. It constitutes about 10% of the weight of rough rice; therefore, about 0.8 – 1.0 million ton annually were available to be used in animal feed industry .

Domyati ducks are a local bread of ducks in Egypt. Although, ducks had gradually increased attention in the last two decades in Egypt for production of meat and hatching eggs but , the experience in duck feeding is still deficient in comparison to that with chickens. Unlike chickens, it is thought that ducklings can tolerate high levels of rice bran in the diet without depressing performance **(Tangendjaja *et al.*, 1986)**.

The objective of this study amid to investigate the effects of feeding laying Domyati ducks on diets containing different levels of rice bran on their productive performance , semen quality , nutrients digestibility, egg

chemical and quality traits , fertility and hatchability traits, some blood constituents, carcass characteristics and economical efficiency .

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. The experiment was conducted from October to. February 2008 .One hundred and eighty (144 females and 36 males) Domyati duck of 26 weeks-old were weighed and randomly distributed into four experimental groups , each group contained 45 ducks. Ducks in all treatments were reared under similar hygienic and managerial conditions . Ducks of each treatment (36 females and 9 males) were taken at random , weighed then divided into three equal replicates (12 females and 3 males each). Ducks of each replicate housed as 2.3 ducks /m^2 in a house with windows and received additional artificial light to provide 16 h light and 8 h dark daily . Throughout the experimental period , feed and fresh water were available all the time. Four diets were formulated and contained rice bran at levels of 0 , 8 , 16 and 24 % and fed to 16 weeks (26 – 41 wks) of age. The composition and calculated analysis of the experimental diets are shown in Table (1).

Data collection : Feed consumption of each replicate for all treatments were weekly recorded , it was then averaged and expressed in grams per duck / 28 day throughout the experimental period (26-41 wks of age). Feed conversion for egg production was also calculated during the same periods. Egg number was daily recorded for 16 weeks from 26 to 41 wks of age . Egg weight was recorded to the nearest gram for each replicate and egg mass was calculated per duck for the same periods as follows : Egg mass per duck =Total egg mass produced / Number of duck at housing

Semen quality traits : Three drakes were randomly taken from each treatment and trained for artificial semen ejaculation by using the abdominal massage technique described by **Kammerer *et al.*(1972).** During and after 6 weeks of training , semen was collected at the base of copulatory organ in graduated tubes. The test was made at 33 weeks of age to evaluate semen quality traits (as ejaculate volume , sperms mass and advanced motility , sperms concentration and percentages of dead, abnormal, coiled-tail and clumped sperms). Semen volume was measured in milliliters using calibrated pipette. Mass motility was estimated microscopically by visual examination on a subjective scale of 1 to 5 where the bottom, the middle and the top of the scale represent poor, good and excellent motility , respectively **(Etches, 1996).**Advanced motility , which is the progressive

movement of spermatozoa ,was also determined by the microscopic examination of semen samples diluted with saline (0.9%NaCl) solution .Each sample was ranked for the percentage of spermatozoa which was observed moving in straight lines across the filed of vision with a normal vigorous swimming motion .The visual scoring of motion ranged from 0.0 (no motility) to 100 (vigorous motility). Sperm concentration was estimated by using an original haemocytometer to count the spermatozoa by adding 0.05 ml of fresh semen to 9.95 ml of a 2.9% sodium citrate solution (by using red pipette) to give a 1: 200 dilution rate, and semen concentration was calculated as follows : Sperm concentration = N x 50 x 200 where , N = Number of sperms per 5 squares of haemocytometer . Percentage of dead spermatozoa was estimated by using the nigrosin / eosin staining procedure **(Hackett and Macpherson,1965).** Percentage of coild-tail sperms was estimated in 200 sperms on a slide prepared for dead sperm determination. The clumping sperms in semen samples was determined by using one drop of freshly undiluted semen in the same manner of advanced motility test as reported by procedure of **El-Wardany *et al.*(1995) , Etches(1996) and Tag El-Din *et al.*(2006).** Clumping of sperm is a phenomenon in which spermatozoa adhere together , forming clumps or masses; like the bacterial colonies, which lead to a poor advanced motility.

Nutrients digestibility: To evaluate the digestibility of nutrients of the experimental diets , a metabolism trial was conducted using 12 adult Domyati duck drakes; with average body weight of about 2.0 kilograms. Each experimental diet was fed to three drakes for seven days as a preliminary period, followed by five days collection period , where excreta were quantitatively collected. Simultaneously, records of daily feed consumption for each drake were maintained . The daily excreta voided by drakes in each treatment were pooled and thoroughly mixed. Then, representative excreta samples were taken and dried immediately . 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) , nitrogen free extract (NFE), total digestible nutrient (TDN) and metabolizable energy (ME) were calculated

Egg quality and chemical analysis traits: At 35 weeks of age, a total number of 60 eggs (15 from each treatment) were taken to determine egg components and quality . At 36 weeks of age, three eggs from each treatment group were randomly taken for chemical analysis , then samples were dried at 105°C until constant weight, ashed at 600°C for 3 hour's

in a forced draught oven, ground and stored to chemical analysis . Proximate analysis was carried out according to the official methods **(AOAC,1995)**.

Egg fertility and hatchability percentages : A total of 270 eggs were collected from each treatment during 36-37 weeks of age to determine fertility and hatchability parameters .They were divided into three equal replicates. Fertility and early embryonic mortality percentages were determined in the tenth day of incubation. Hatchability and late embryonic mortality percentages were determined at the end of incubation period

Slaughter test: At the end of 41 weeks of age, three ducks from each treatment group were randomly taken for slaughter test. Ducks were fasted for 12 hours before slaughtering and individually weighed pre and after slaughtering until complete bleeding. Presently after scalding , feather picking and evisceration were performed and different body parts , organs and abdominal fat were dissected and weighed .

Blood samples: During slaughtering , blood samples were collected in heparinized test tubes and centrifuged at 3500 rpm for 10 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

Laying performance of Domyati ducks :-

Results of Table (2) revealed no significant differences in live body weights and mortality rate of laying Domyati ducks. It may be due to laying ducks ability which can be tolerate the studied levels of rice bran in the diets. Similar results were found by **Piliang *et al.* (1982) and Rezaei**

(2006) who reported that no negative effects of feeding inclusion level of rice bran up to 25 % on the mortality.

Results of Table (3) showed a significant difference among the experimental groups in egg number and its mass per duck and laying rate (%) during all the interval periods with the exception of the periods 26-29 and 38-41 wks of age which had insignificantly affected. However, the overall mean of egg number per duck was significantly ($P \leq 0.01$) improved by 13.77 % for the group fed diet containing rice bran by 24 % compared with that of the control . which , the opposite was true with treatment of 8 and 16 % rice bran which were statistically equal with that of the control. Similar trend was recorded with laying rate (%) and egg mass parameters. These results may be due to that rice bran is rich in B-vitamins, tocopherols and its nutrient density and profiles of amino acids and fatty acids because it consists of seeds or kernels, particles of pericarp, seed coat, aleurone, germ and fine starchy endosperm **(Khan ,2004).** No significant differences were detected among the experimental groups regarding egg weights during different periods due to the experimental treatments with the exception of the period 38-41 wks of age which was significantly affected ($P \leq 0.05$). These results may be due to the improvement in egg number and /or rice bran high content of fatty acids , including 74% of unsaturated fatty acids . Although, rice bran content both of protein and fat are of relatively high biological value **(Khan ,2004),** it is probably due to the elevated level of linoleic acid in the diet **(Haghnazar and Rezaei, 2004).**

Results of Table (4) showed a significant difference was found among the experimental groups in feed conversion at periods 30-33, 34-37 and 26-41 wks of age . Whereas, feed consumption values were not significantly affected among the experimental groups during all periods. Feed consumption values (g/duck/ day) were slightly increased or decreased due to the treatment for groups fed diets contained rice bran during all experimental periods. Daily feed consumption per duck was insignificantly increased by 3.15 , 5.21 and 1.87 % of the group fed diet contained rice bran by 24 % during periods 26-29 , 38-41 and 26-41 wks of age , respectively compared to the control group. These results may be due to the palatability of the diet which was not changed by using rice bran and it is also possible due to that , the ducks are supplied by their requirements of different dietary nutrients rather than increasing feed consumption .

Feed conversion (g. feed / g. egg mass) was significantly improved by 14.94 , 16.78 , 8.29 and 12.78 % for the groups fed diets contained rice bran by 16 and 24 % during periods 34-37 and 26-41 wks of age as compared to the control, respectively. These results may be attributed to the

improvement in egg number and egg mass per duck due to rice bran effects nutritional status, vitamins and minerals , level of dietary fat and cholesterol, and hormonal factors which could affect feed metabolism.

The present results are in agreement with those reported by **Piliang *et al.*(1982) and Farrell (1994)** showed that rice bran could be included up to 40 to 45 % in the diet of commercial layers without adverse effect on productive performance. Feeding laying hen on diets containing 22 –25 % rice bran had no adverse effect on productive performance **(Ensaf *et al.*, 2000 and Tangendjaja *et al.*, 2002). Popescu and Ciurascu (2003)** and **Sharara *et al.*(2003)** noticed that the layer fed diets containing 15- 20 % of rice bran have registered high quantitative and qualitative performance in egg production . **Rezaei (2006)** who showed that feeding laying hen with maize-soybean meal diets containing 25% of mixed rice bran was practically feasible without compromising performance, feeding diets containing 10 and 15% of mixed rice bran had the best values for egg weight and egg mass . **Ersin *et al.*(2006)** reported that rice bran could be used up to 10% in layer diets without any adverse affect on laying performance.

Semen quality :-

Results of Table (5) showed no significant differences by using different levels of rice bran in the diets of Domyati drakes for all studied semen quality traits with the exception of sperm concentration which was significantly ($P \leq 0.05$) affected. Semen volume was increased by 73.9 , 52.2 and 104.3 % of drakes fed diets contained rice bran at levels of 8 , 16 and 24 % as compared to the control, respectively . Also, rice bran inclusion had no significant effects on both mass motility and advanced motility . On the other hand, the sperm concentration was significantly decreased by increasing rice bran level in the diet from 8 up to 24 % by about 11.11 and 15.56 % as compared to the control, respectively . It may be due to the increasing of semen volume produced which may have been related to the negative correlation between semen volume and concentration **(El-Wardany et al.,1995)** . The total sperm abnormality of drakes fed diets contained rice bran at levels of 8 ,16 and 24 % were decreased by 14.17 , 10.83 and 14.17 % as compared to the control, respectively . Although total sperm abnormalities was decreased by feeding diets contained rice bran at either levels 8 or 16 % , dead sperms was increased by 5.26 and 10.53 % as compared to the control, respectively. Clumping sperms was decreased by 8.51 % for groups fed diet contained rice bran at levels 16 and 24 %. The percentage of coild – tail and clumped sperms were insignificantly reduced by feeding diets contained rice bran at levels 16 and 24 % as compared to

the control. In comparison to the control group and those drakes having 8 and 16 % rice bran, the drakes fed diet contained rice bran by 24 % are superior with respect to advanced motility by about 1.3, 3.3 and 1.4 % respectively. These results may be due to that rice bran is rich in B-vitamins, tocopherols and /or high biological values of its protein and fat content **(Khan ,2004)**

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 (6). Results showed a significant effect ($P \leq 0.01$) was found on ash and nitrogen retention and digestion coefficients of CP and EE due to feeding diets contained inclusion levels of rice bran , where , digestion coefficients of DM , OM, CF, NFE and nutritive value (TDN % and ME kcal / kg) were insignificantly different. Which , ash retention was significantly increased by 12.93, 18.76 and 19.17 % for drakes fed diets contained rice bran at levels of 8 , 16 and 24 % as compared to the control , respectively. Nitrogen retention was significantly increased by 8.68 % for drakes fed diet contained 24 % rice bran as compared to that of the control. Also, digestibility coefficients of CP and EE were significantly improved by about 5.82 and 5.99 % for drakes fed diet contained 24 % rice bran as compared to control, respectively. Feeding diet contained rice bran at 24 % resulted in improving EE and CP digestibilities. It may be due its dietary oil content of rice bran and increase N-retention value. The opposite was true with DM , OM , CF and NFE digestibility which did not affected because of high fiber content which may have been increased output of these nutrients (***Farrell and Martin, 1998***).

Hatchability traits :-

Fertility, hatchability, embryonic mortality percentages and chick weights as feeding laying Domyati ducks diets contained different levels of rice bran are presented in Table (7).The statistical analysis of data of incubated eggs showed no significant differences were found among treatments for egg fertility , hatchability, early and late embryonic mortality percentages and chick weights. However, fertility percentages numerically improved by about 1.57 , 4.46 and 5.42 % for the groups fed diets contained rice bran at levels of 8 , 16 and 24 % as compared to those of the control, respectively. Hatchability percentages were also improved by about 6.72 and 6.24 % for setting eggs and 2.08 and 1.28 % for fertile eggs of groups fed diets contained rice bran at levels of 16 and 24 % as compared to those of the control, respectively. Although, early embryonic mortality was

decreased by about 22.82 and 23.51 %, late embryonic mortality increased by 6.27 and 6.77 % for the groups fed diets at levels of 16 and 24 % rice bran as compared to the control, respectively. Duckling weight not affected due to treatments .

The improvement of fertility and hatchability percentages and early embryonic mortality may be due to B-vitamins, tocopherols , some minerals of rice bran as well as its biological values of protein and fat ***(Khan ,2004).***

Blood plasma parameters:-

Plasma parameters of laying Domyati ducks, measured in the present study , were estimated to show the metabolic status of ducks and their health as affected by feeding dietary levels of rice bran . Data of some blood plasma constituents of 41 wks -old laying Domyati ducks fed the diets contained different levels of rice bran (Table 8) showed no significant difference was found among treatments in total protein and plasma transaminases (AST and ALT). While, plasma triglycerides, total cholesterol and glucose were significantly ($P \leq 0.01$) affected.

Plasma triglycerides were significantly decreased by 15.20 and 13.79 % for groups fed diets contained rice bran by 16 and 24 % as compared to the control , respectively. Also, plasma total cholesterol was significantly decreased by 24.64 and 17.69 % for groups fed diets contained rice bran at levels of 16 and 24 % as compared to the control , respectively. Plasma glucose was significantly decreased by 9.17 and 18.53 % for the groups fed diets contained rice bran at levels of 16 and 24 % as compared to the control , respectively.

Means of plasma transaminases (AST and ALT) were lower than the control due to treatments, which reflected the good metabolic status of ducks. The reduction in plasma cholesterol of duck layers fed rice bran could be attributed to the characteristic composition of rice bran including soluble fiber , polyunsaturated fatty acids and some active components which could inhibit hydroxymethyl glutaryl Coenzyme A (HMG-CoA) reductase activity, thus decreasing cholesterol synthesis ***(Hegsted and Kousik ,1994).***In this connection ***Hargis (1988)*** reported that several variables have been shown to affect the HMG-CoA reductase activity, including nutritional status, level of dietary fat and cholesterol, and hormonal factors. The present results are in agreement with those reported by ***Rouanet et al. (1993) and Hegsted and Kousik (1994)*** who noticed that feeding rats on crude rice bran lowered total cholesterol in comparison with wheat bran and tended to decrease triglycerides and this was mainly attributed to its high soluble fiber content. Also, ***Sharara et al.(2003)***

noticed that the layers fed diets containing 10 % of rice bran had low cholesterol concentration in blood serum .

Egg quality :-

Data of components and quality measurements of eggs produced by laying Domyati ducks fed diets contained rice bran at different levels at 35 wks-old are presented in Table (9). It is clear, no significant differences were observed among the experimental groups in egg components and quality measurements .However, relative weights of yolk and egg shell , Haugh units and eggshell thickness were improved by feeding diets contained rice bran of 24 % . Similar results were found by ***Piliang et al. (1982) , Abd El-Ghany et al. (1997) and Ensaf et al.(2000)*** who reported that adding different levels of rice bran as substitution for yellow corn insignificantly affected albumen, yolk and shell percentages, Haugh units, yolk index and shape index. Chemical composition data of eggs produced by laying Domyati duck fed diets contained rice bran at different levels at 35 wks-old are presented in Table (10).No significant differences were observed among the experimental groups in moisture, dry matter, crude protein, ether extract and ash due to the treatments . Values of dry matter and ether extract were decreased by about 3.13 and 5.82 % by feeding diet contained rice bran of 24 % as compared to the control , respectively. While, ash was slightly increased by feeding the studied diets contained rice bran compared to that of the control.

Carcass characteristics :-

Results of Table (11) showed no significant difference was found among the experimental groups in relative weight of some carcass traits for Domyati ducks at 41 weeks of age due to the treatments . Dressed carcass percentages were decreased by 0.53 , 3.48 and 1.17 % for the groups fed diets contained rice bran at levels of 8 , 16 and 24 % as compared to the control, respectively. Also edible part percentages were decreased by 2.13 , 3.22 and 1.12 % for these groups as compared to the control. It is worthy to note that abdominal fat was slightly increased by using rice bran in the diets compared to the control .These results may be due to increasing dietary fat gradually with using different levels of rice bran and the type of duck breed as well as the time of slaughter test which occurred during laying period .Similarly ***Ensaf et al.(2000)*** reported that feeding rice bran as substitute for yellow corn in layer 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 rice bran had no effect on liver or gizzard percentages.

Economical efficiency:-

Calculations were carried out according to the prices of feed ingredients, additives and eggs. prevailing during year 2007 (the experimental time) as listed in Table (12). The economical efficiency values of laying Domyati ducks fed diets containing rice bran during the studied laying period from 26 to 41 weeks of age were 0.101, 0.136, 0.215 and 0.343 as feeding diets containing rice bran at levels of 0, 8, 16 and 24 %, respectively. So increasing inclusion levels of rice bran resulted to improves net return per duck and economical efficiency compared to those of the control. It may be due to the improvement of egg production rate and feed conversion as well as decreasing the feed cost.

CONCLUSION

Generally the best results in most studied traits were recorded for diets contained rice bran at levels 16 and 24 % during the studied laying periods. So, rice bran could be used in laying duck diet by levels up to 24 % to maximize the productivity and profitability in addition to the hatchability traits and economical efficiency of Domyati ducks .

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

Ingredients %	Control	Rice bran %		
		8	16	24
Yellow corn	66.00	59.00	52.00	45.00
Soy bean meal (44 %)	24.20	23.20	22.20	21.20
Rice bran	0.00	8.00	16.00	24.00
Di-calcium phosphate	1.50	1.50	1.50	1.50
Limestone	7.50	7.50	7.50	7.50
Vit & Min. premix *	0.30	0.30	0.30	0.30
NaCl	0.30	0.30	0.30	0.30
DL. Methionine (97%)	0.20	0.20	0.20	0.20
Total	100	100	100	100
Calculated Analysis **				
Crude protein %	16.46	16.46	16.45	16.45
ME (Kcal / kg)	2759	2746	2734	2723
Crude fiber %	3.15	3.83	4.52	5.19
EE %	2.70	3.47	4.23	5.01
Calcium (%)	3.27	3.27	3.27	3.27
Available phosphorus (%)	0.40	0.41	0.42	0.42
Lysine %	0.88	0.88	0.88	0.88
Methionine %	0.50	0.50	0.50	0.50
Meth. + Cyst %	0.77	0.76	0.76	0.75

* Each 3kg of Vit .and Min. premix contains 100 million IUVit A;2 million IU Vit.D3;10 g Vit.E; 1 g Vit.K_3; 1 g Vit B1; 5 g Vit B2 ;10 mg Vit.B12 ; 1.5 g Vit B6; 30 g Niacin ;10 g Pantothenic acid ;1g Folic acid;50 mg Biotin ; 300 g Choline chloride; 50 g Zinc; 4 g Copper; 0.3 g Iodine ; 30 g Iron; 0.1 g Selenium ;60g Manganese ;0.1 g Cobalt; and carrier $CaCo_3$ to 3000 g .

** According to NRC (1994)

Table (2) : Effect of rice bran on live body weight (LBW) and mortality of laying Domyati ducks (Means ±SE) .

Age (wks)	Rice bran, %			
	0	8	16	24
Live body weight (g)				
26 wks	1770.0 ±34.6	1785.0 ±63.5	1800.0 ±40.4	1810.0 ±52.0
41 wks	1680.0 ±46.2	1675.0 ±69.3	1705.0 ±37.5	1730.0 ±49.1
Change of LBW	- 90.0 ±20.2	- 110.0 ±14.5	- 95.0 ±17.3	- 80.0 ±34.6
Mortality*	2/45	1/45	1/45	2/45

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

* Number of dead duck per total number per treatment

Table (3) : Effect of rice bran on egg number, laying rate ,egg mass and egg weight (Means ±SE) of laying Domyati ducks .

Age (wks)	Rice bran, %				Sig.
	0	8	16	24	
Egg number /duck / 28 day					
26 - 29	12.15 ±0.69	13.01 ±0.57	11.93 ±0.76	14.92 ±0.66	NS
30 - 33	18.58 ±0.34 ^{ab}	16.61 ±0.33 ^{c}	17.14 ±0.93 ^{bc}	19.75 ±0.38 ^{a}	0.01
34 - 37	16.90 ±0.68 ^{b}	16.50 ±0.81 ^{b}	18.07 ±0.96 ^{ab}	19.60 ±0.43 ^{a}	0.05
38 - 41	12.80 ±0.60	12.93 ±0.26	14.10 ±0.23	14.48 ±1.16	NS
Overall mean	60.43 ±1.10 ^{b}	59.05 ±0.31 ^{b}	61.24 ±0.80 ^{b}	68.75 ±2.04 ^{a}	0.01
Laying rate %					
26 - 29	43.40 ±2.48	46.45 ±2.04	42.60 ±2.70	53.30 ±5.56	NS
30 - 33	66.37 ±1.21 ^{ab}	59.33 ±1.17 ^{c}	61.21 ±3.32 ^{bc}	70.55 ±1.33 ^{a}	0.01
34 - 37	60.36 ±2.43 ^{b}	58.93 ±2.89 ^{b}	64.52 ±3.44 ^{ab}	70.0 ±1.56 ^{a}	0.05
38 - 41	45.71 ±2.15	46.18 ±0.93	50.36 ±0.83	51.71 ±4.13	NS
Overall mean	53.95 ±0.99 ^{b}	52.73 ±0.28 ^{b}	54.68 ±0.71 ^{b}	61.39 ±1.82 ^{a}	0.01
Egg mass (g / duck /28 day)					
26 - 29	788.0 ±44.5	860.3 ±57.4	786.7 ±57.7	980.0 ±90.8	NS
30 - 33	1222.0 ±21.0 ^{b}	1106.7 ±31.3 ^{c}	1151.3 ±45.8 ^{bc}	1330.3 ±23.8 ^{a}	0.01
34 - 37	1147.0 ±51.1 ^{b}	1136.7 ±46.8 ^{b}	1253.3 ±76.8 ^{ab}	1374.3 ±23.9 ^{a}	0.05
38 - 41	879.3 ±34.9	910.3 ±13.6	997.0 ±17.0	1026.3 ±83.1	NS
Overall mean	4036.3 ±53.2 ^{b}	4014.0 ±57.3 ^{b}	4188.3 ±83.1 ^{b}	4711.0 ±148.0 ^{a}	0.01
Egg weight (g)					
26 - 29	64.86 ±0.55	66.13 ±1.54	65.94 ±1.42	65.80 ±0.70	NS
30 - 33	65.77 ±0.17	66.63 ±0.57	67.17 ±0.93	67.34 ±0.48	NS
34 - 37	67.87 ±0.29	68.89 ±0.92	69.36 ±0.59	70.14 ±0.69	NS
38 - 41	68.70 ±0.55 ^{b}	70.40 ±0.48 ^{a}	70.71 ±0.55 ^{a}	70.87 ±0.27 ^{a}	0.05
Overall mean	66.80 ±0.41	67.98 ±0.76	68.39 ±0.83	68.53 ±0.12	NS

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

Table (4) : Effect of rice bran on feed consumption and feed conversion (Means ±SE) of laying Domyati ducks .

Age (wks)	Rice bran, %				Sig.
	0	8	16	24	
Feed consumption (g / duck / day)					
26 - 29	145.8 ±1.5	140.0 ±10.8	147.0 ±2.5	150.4 ±10.2	NS
30 - 33	160.0 ±3.7	155.0 ±5.6	151.1 ±7.3	159.1 ±8.3	NS
34 - 37	177.7 ±7.6	171.1 ±9.3	164.1 ±5.0	171.0 ±14.6	NS
38 - 41	159.3 ±7.6	160.4 ±7.8	163.3 ±3.6	167.6 ±9.8	NS
Overall mean	160.7 ±2.3	156.6 ±5.8	156.4 ±1.8	163.7 ±5.5	NS
Feed conversion (g feed : g egg mass)					
26 - 29	5.21 ±0.28	4.57 ±0.19	5.28 ±0.35	4.35 ±0.31	NS
30 - 33	3.67 ±0.12 ^{ab}	3.92 ±0.03 ^{b}	3.69 ±0.24 ^{ab}	3.35 ±0.03 ^{a}	0.01
34 - 37	4.35 ±0.12 ^{c}	4.22 ±0.16 ^{bc}	3.70 ±0.25 ^{ab}	3.62 ±0.09 ^{a}	0.05
38 - 41	5.10 ±0.30	4.94 ±0.21	4.59 ±0.13	4.60 ±0.20	NS
Overall mean	4.46 ±0.03 ^{c}	4.37 ±0.06 ^{c}	4.09 ±0.05 ^{b}	3.89 ±0.05 ^{a}	0.01

a,b,c :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 semen quality traits (Means ±SE) of Domyati drakes at 33 weeks of age .

Semen characteristics	Rice bran, %				Sig.
	0	8	16	24	
Ejaculate volume (ml)	0.23 ±0.03	0.40 ±0.06	0.35 ±0.08	0.47 ±0.09	NS
Mass motility	4.66 ±0.33	4.33 ±0.33	4.33 ±0.33	4.66 ±0.33	NS
Advanced motility	91.70 ±3.30	90.0 ±2.90	91.70 ±1.70	93.30 ±1.70	NS
Sperm concentration (mm x 10^6)	3.60 ±2.90^{a}	3.20 ±2.40^{b}	3.20 ±2.30^{b}	3.04 ±3.0^{c}	0.05
Total sperm abnormalities (%)	12.0 ±1.20	10.30 ±1.20	10.70 ±0.90	10.30 ±0.07	NS
Dead sperms (%)	5.70 ±0.70	6.0 ±0.60	6.30 ±0.70	5.70 ±1.20	NS
Coild – tail sperms (%)	4.30 ±0.90	4.30 ±0.70	4.0 ±0.60	4.0 ±0.60	NS
Coild /total / abnormalities (%)	43.80 ±11.6	44.10 ±9.0	37.10 ±2.50	38.40 ±3.70	NS
Clumping sperms (%)	4.70 ±0.07	5.0 ±0.60	4.30 ±0.30	4.30 ±0.30	NS

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

Table (6): Effect of rice bran on ash and nitrogen retention and digestion coefficients (Means ±SE) of nutrients for adult Domyati drakes .

Item , %	Rice bran ,%				Sig.
	0	8	16	24	
Ash retained	26.60±0.67^{b}	30.04±0.80^{a}	31.59±0.80^{a}	31.70±0.56^{a}	0.01
N - retained	59.24±0.61^{b}	59.27±0.62^{b}	59.32±0.61^{b}	64.38±0.60^{a}	0.01
Digestion coefficient, %					
Dry matter	65.41 ±0.59	65.55 ±0.61	65.58 ±0.71	65.65 ±0.59	NS
Organic matter	76.78 ±0.58	77.56 ±0.59	77.24 ±0.68	77.43 ±0.63	NS
Crude protein	88.48±0.58^{b}	88.58±0.55^{b}	88.62±0.53^{b}	93.63±0.63^{a}	0.01
Ether extract	87.36±0.64^{b}	87.48±0.62^{b}	87.68±0.54^{b}	92.60±0.62^{a}	0.01
Crude fiber	27.46 ±0.61	27.47 ±0.56	27.51 ±0.64	27.53 ±0.54	NS
Nitrogen free extract	82.30 ±0.63	83.81 ±0.62	83.53 ±0.76	81.61 ±0.65	NS
TDN %	69.88 ±0.50	69.35 ±0.49	69.34 ±0.58	69.94 ±0.54	NS
ME (k cal/kg)	2935.0 ±12.0	2913.0 ±20.7	2912.3 ±24.5	2937.5 ±22.5	NS

a,b,c :means in the same row bearing different superscript are significantly different (P≤ 0.05).
*Fraps (1946) : ME = TDN x 4.2

Table (7): Effect of rice bran on fertility and hatchability traits (Means ±SE) of Domyati duck eggs .

Parameters *	Rice bran, %			
	0	8	16	24
Total setting eggs	270	270	270	270
Egg weight g	69.87 ±0.29	68.95 ±0.92	69.60 ±0.59	68.70 ±0.69
Fertility %	86.51 ±0.80	87.87 ±1.99	90.37 ±0.87	91.20 ±2.33
Hatchability of setting eggs %	69.05 ±2.75	69.70 ±4.21	73.69 ±1.53	73.36 ±1.82
Hatchability of fertile eggs %	79.88 ±3.81	79.20 ±3.39	81.54 ±1.07	80.90 ±3.00
Early E.M** %	10.08 ±0.88	8.58 ±0.80	7.78 ±1.99	7.71 ±1.02
Late E.M. %	10.04 ±3.19	12.22 ±3.95	10.67 ±1.61	10.72 ±2.51
Chick weight g	44.63 ±0.98	43.23 ±1.06	43.0 ±0.81	42.60 ±0.98

* No significant differences were observed among treatments in all parameters studied.
** EM = Embryonic mortality .

Table (8) : Effect of rice bran on plasma constituents (Means ±SE) of laying Domyati ducks at 41 wks of age .

Criteria	Rice bran, %				Sig.
	0	8	16	24	
Total protein g/dl	7.5 ±0.5	7.3 ±0.2	7.6 ±0.4	7.9 ±0.4	NS
Triglycerid. mg /dl	1157.7 ±42.4^{a}	1091.3 ±35^{ab}	981.7 ±45.02^{b}	998.0 ±39.3^{b}	0.01
Total cholesterol mg/dl	201.3 ±4.6^{a}	195.0 ±8.7^{a}	151.7 ±6.9^{b}	165.7 ±12.2^{b}	0.01
Glucose mg/dl	162.4 ±2.8^{a}	152.3 ±3.5^{ab}	147.5 ±4.6^{b}	132.3 ±4.3^{c}	0.01
AST U/L	54.3 ±3.10	48.07 ±3.9	51.1 ±3.35	46.2 ±1.29	NS
ALT U/L	25.80 ±7.70	21.53 ±5.46	22.03 ±5.10	21.77 ±2.60	NS

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 egg quality measurements (Means ±SE) of Domyati duck eggs at 35 wks of age .

Parameters*	Rice bran, %			
	0	8	16	24
Egg weight (g)	69.27±2.85	70.88±3.71	70.08±2.82	70.33±3.08
Yolk weight %	31.22±1.88	30.90±1.19	31.03±1.88	31.56±1.28
Albumen weight %	57.28±2.06	57.82±1.52	57.56±1.84	56.60±1.94
Egg shell weight %	11.50±0.47	11.28±0.81	11.41±0.52	11.84±0.68
Eggshell thickness (mm)	0.36±0.01	0.38±0.03	0.39±0.02	0.40±0.02
Haugh units	82.94 ±3.55	85.85 ±2.33	85.90 ±2.40	86.05 ±1.85
Yolk index	0.43±0.03	0.43±0.03	0.43±0.02	0.42±0.02
Shape index	0.80±0.02	0.78±0.02	0.78±0.02	0.78±0.02

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

Table (10) : Effect of rice bran on chemical composition (Means ±SE) of Domyati duck eggs at 36 wks of age-.

Parameters*	Rice bran, %			
	0	.8	16	24
Moisture	68.39 ±0.30	68.78 ±0.44	68.83 ±0.35	69.38 ±0.39
Dry matter	31.61 ±0.30	31.22 ±0.44	31.17 ±0.35	30.62 ±0.39
Crude protein	13.60 ±0.12	13.37 ±0.81	13.10 ±0.47	13.13 ±0.13
Ether extract	15.63 ±0.35	15.57 ±1.22	14.97 ±0.64	14.72 ±0.49
Ash	1.05 ±0.05	1.12 ±0.08	1.15 ±0.03	1.08 ±0.06

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

Table (11) : Effect of rice bran on carcass characteristics (Means ±SE) of Domyati ducks at 41 wks of age .

Parameters*	Rice bran, %			
	0	8	16	24
L.B.W. (g)	1710.0 ±34.6	1690.0 ±63.5	1730.0 ±40.4	1760.0 ±52.0
%				
Head	3.17 ±0.17	2.94 ±0.12	3.04 ±0.38	2.90 ±0.16
Abdominal fat	0.29 ±0.08	0.34 ±0.05	0.31 ±0.08	0.36 ±0.08
Liver	3.37 ±0.29	2.72 ±0.16	3.48 ±0.33	3.66 ±0.33
Gizzard	2.79 ±0.08	2.52 ±0.18	2.64 ±0.17	2.62 ±0.33
Heart	0.69 ±0.08	0.70 ±0.12	0.70 ±0.03	0.69 ±0.04
Giblets	6.85 ±0.30	5.94 ±0.44	6.82 ±0.37	6.97 ±0.46
Dressed carcass	58.27 ±1.82	57.96 ±2.01	56.24 ±1.33	57.59 ±1.69
Edible parts	68.29 ±1.94	66.83 ±1.46	66.09 ±1.39	67.46 ±1.77
Un edible parts	31.71 ±1.94	33.17 ±1.46	33.91 ±1.39	32.54 ±1.77

* No significant differences were observed among treatments in all parameters studied.
L.B.W = live body weight
Giblets % = liver % + gizzard % + heart %
Dressed carcass %= total carcass (without head , legs, abdominal fat, viscera and lunges) as percent of LBW
Edible parts % = dressed carcass % + giblets % + head %

Table (12) : Effect of rice bran on economical efficiency of laying Domyati ducks .

Parameters*	Rice bran, %			
	0	8	16	24
Average feed consumption kg per duck during overall period	17.998	17.539	17.517	18.334
Cost / kg feed , L.E [1]	1.830	1.778	1.727	1.675
Total feed cost , L.E[2]	32.94	31.18	30.25	30.71
Number of egg produced /duck	60.43	59.05	61.24	68.75
Price of one egg , L.E[3]	0.60	0.60	0.60	0.60
Total return /duck , LE	36.26	35.43	36.74	41.25
Net return / duck . LE	3.32	4.25	6.49	10.54
EEF[4]	0.101	0.136	0.215	0.343
Relative EEF[5]	100	134.7	212.9	339.6

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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الملخـص العربـي

تأثيـر استخدام رجيـع الكـون فـي علائـق البـط علـى :

١- أداء إنتـاج البيـض وصفـات التفريـخ للبـط الدمياطـي

عوض لطفي عوض ، مجدي أحمد عوض حسين ، أيمن إبراهيم عبده غنيم ، محمد جاد الحق قاسم ، إبراهيم عبد السلام حموده

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أجرى هذا البحث لدراسة تأثير إستخدام رجيع الكون بمستويات متدرجة في علائق البط الدمياطي خلال فترة إنتاج البيض على أداء إنتاج البيض وصفات التفريخ وصفات السائل المنوي ومعاملات هضم العناصر الغذائية ومقاييس جودة البيض و التحليل الكيماوي له وبعض صفات الدم والكفاءة الاقتصادية . تم استخدام عدد ١٨٠ طائر بط دمياطي عمر ٢٦ أسبوع (١٤٤ بطة و ٣٦ ذكر) تم تقسيمهم إلى أربعة مجاميع تجريبية (٣٦ أنثى و ٩ ذكور لكل مجموعة تجريبية) ثم وزنت طيور كل مجموعة ووزعت عشوائيا على ثلاث مكررات متساوية. تم تكوين العلائق

التجريبية الأربعة المحتوية على رجيع الكون بمستويات (صفر ، ٨ ، ١٦ ، ٢٤ %) وتم تقديمها للمجموعات التجريبية الأربعة خلال فترة التجربة (٢٦ – ٤١ أسبوع) ، وتم وزن البط عند بداية ونهاية التجربة . سجل استهلاك العليقة وعدد ووزن البيض الناتج (لكل فترة ٢٨ يوم) وخلال الفترة الكلية من ٢٦ – ٤١ أسبوع ، وتم جمع للسائل المنوي من الذكور وتقدير بعض صفاته ، كما قدرت بعض مقاييس جودة البيض الخارجية والداخلية عند عمر ٣٥ أسبوع ، وتم جمع البيض على فترات مختلفة من التجربة وتخزينه لمدة عشرة أيام لإجراء عملية تفريخ له وحساب نسب الخصوبة والفقس للبيض الكلى والمخصب وحساب النفوق الجنيني المبكر والمتأخر ،أيضا أجريت تجربة هضم على بعض الذكور لتقدير معاملات الهضم للمركبات الغذائية بالعليقة ، وتم أخذ عينات دم من البط عند عمر ٤١ أسبوع أثناء إجراء اختبار الذبح لتقدير محتويات بلازما الدم من البروتين الكلى والجلسريدات الثلاثية والكولسترول الكلى والجلوكوز وإنزيمات الترانس أمينيز (AST,ALT) وفى النهاية تم تقدير الكفاءة الاقتصادية للمعاملات الغذائية خلال فترة إنتاج البيض.

وبتحليل النتائج اتضح الآتي :-

- تحسن معنوي في عدد البيض وكتلة البيض الناتج لكل بطة وكذلك معدل إنتاج البيض للمجموعة التي تغذت على العليقة المحتوية على رجيع الكون بمستوى ٢٤ % مقارنة بالكنترول خلال مدة التجربة من ٢٦ – ٤١ أسبوع .
- لم تتأثر معنويا كمية العليقة المستهلكة لكل بطة بينما تحسن معنويا معامل التحويل الغذائي لانتاج البيض للمعاملات التي تغذت على عليقه تحتوى على رجيع كون بمستوى ١٦ و ٢٤ % مقارنة بالكنترول خلال مدة التجربة من ٢٦ – ٤١ أسبوع .
- لم تتأثر معنويا صفات السائل المنوي بينما انخفض تركيز الاسبرمات معنويا (٥%) للمعاملات التي تغذت على رجيع الكون بمستوياته المختلفة مقارنة بالكنترول .
- تحسنت معنويا نسبة كل من الرماد والنيتروجين المحتجزين ومعامل هضم البروتين الخام والمستخلص الايثيرى للمجموعة التي تغذت على عليقه تحتوى على رجيع كون بمستوى ٢٤ % بالمقارنة بالكنترول .
- لم تتأثر معنويا صفات التفريخ للبيض الناتج بالمعاملات التجريبية وان كانت نسبتي الخصوبة و الفقس تحسنت وكذلك انخفضت نسبة النفوق الجنيني المبكر للمجموعات التي تغذت على عليقه تحتوى على رجيع كون بمستوى ١٦ و ٢٤ % مقارنة بالكنترول.
- لم تتأثر صفات الدم المدروسة معنويا بالمعاملات فيما عدا محتوى البلازما من الجلسريدات الثلاثية والكولسترول الكلى و الجلوكوز والتي انخفضت معنويا للمجموعات التي تغذت على عليقه تحتوى على رجيع كون بمستوى ١٦ و ٢٤ % بالمقارنة بالكنترول
- لم تتأثر معنويا مقاييس جودة البيض المختلفة والتركيب الكيماوي له وكذلك قياسات الذبيحة المدروسة بالمعاملات التجريبية مقارنة بالكنترول .
- تحسنت الكفاءة الاقتصادية وصافى العائد لكل بطة بالمعاملات التجريبية مقارنة بالكنترول .

من النتائج السابقة يمكن الاستنتاج بأن إستخدام رجيع الكون في علائق البط البياض بمستوى يصل إلى ٢٤٠ جم / كجم عليقة يمكن أن يؤدى إلى تحسن في مقاييس الأداء الإنتاجي وصفات التفريخ والكفاءة الاقتصادية وبدون أي تأثير معاكس على هذه المقاييس .