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YELLOW CORN REPLACED BY DISTILLERS DRIED GRAINS WITH SOLUBLES (DDGS) OF DIETARY JAPANESE QUAIL.

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ABSTARCT: Effect of replacing yellow corn (YC) by distillers dried grains with Solubles (DDGS) was studied on Japanese quail chicks performance. One hundred and eighty unsexed one- day old chicks, distributed at random equally into 3 groups each in 3 replicates. Treatments were: control with 0% DDGS, T_1 containing 50% of YC as DDGS and T_2 containing 100% of YC as DDGS. The experiment lasted for 42 days and all chicks had free access to feed and water. Average feed intake (FI), daily gain (BWG) and feed conversion efficiency (FCR) were determined. Data showed that, chicks fed100 % and 50% of YC as DDGS had higher BWG at 42 days, higher FI and better FCR compared to the control diet. Also, T_1 and T_2 had the highest globulin concentrations and total plasma protein, than the control diet. No significant effect of DDGS levels on carcass characteristics. Digestibility of crude protein was affected significantly ($p<0.05$) with increasing DDGS level. In conclusion, use of DDGS at 100% of YC showed the higher results compared to the other treatments. Therefore, DDGS could be successfully replaced 100% of YC in diet of Japanese quail.

Key words: DDGS, quail, growth, blood, carcass, digestibility.

INTRODUCTION

(DDGS) Distillers dried grains with solubles is a co-product from the dry- milling process for ethanol production, (Davis, 2001). 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 DDGS. (Renewable Fuels Association, 2005). Also, there were three types of residual co-products produced from grains. Distillers Dried Grains (DDG), Distillers Dried Solubles (DDS) and Distillers Dried Grains with Solubles (DDGS). Among the three co-products the (DDS) fraction is the richest source of vitamins, the highest in fat and lowest in fiber, yielding approximately 91% digestible energy (DE) value of the corn (Wang et al. 2007b) . DDGS as a common commercially available product is a blend of DDS and DDG with intermediate nutrient composition, new generation of DDGS from modern ethanol plants is an acceptable feed ingredient for dietary broiler with different recommended percentages in all grower periods. The differences in dried distillers grains with solubles associated with type of ethanol plant design, the processing methods, and storage capacity (Charles, 2007). Variations in nutrient contents of DDGS may create difficulty in feeding poultry and least cost formulation (Bregendahl, 2008). In previous studies of broilers, it was cleared that using DDGS in broiler diets at levels of 5, 10 up to 15% could decrease feed cost by substitute a part of corn and soybean meal without any adverse effect on growth performance (Choi et al., 2008). Also, Oryschak et al. (2010) showed that there was no negative effect of including corn or wheat DDGS up to 10% of the diet on broiler performance. Wang et al. (2007a,b) showed good quality of DDGS can be used in grower and starter broiler diets at levels of 20% with even higher of 30% in the finisher diet with little or no negative effect on broiler performance.

The aim of this study is to evaluate the effect of replacing (DDGS) by yellow corn at level 50 and 100% on Japanese quail chicks performance.

MATERIALS AND METHODS

Animals, diets and experimental design:

The present study was carried out at private poultry farm located at Kafr El-Shikh, Kafr El-Shikh Governorate, Egypt. A total number of 180 one-day old of Japanese quail chicks, with an average weight of 9 g were randomly distributed into three dietary experimental groups, each group with three replicates of 20 chicks in each in a completely randomized design. Chicks were reared in pens with litter (rice straw) through the experimental period under similar managerial and healthy conditions. Feed and water were provided ad libitum through the experimental period. The experimental diets in Table (1) were formulated to supply the nutritional requirements recommended by the NRC (1994). The diets were fed in a mash form, and were formulated according to the chemical composition of DDGS. First group was used as a control, the second group (T1) was fed DDGS at 50% of YC and the third group (T2) was fed DDGS at 100% of YC, (Table 1). The chemical composition of DDGS is presented in Table 2. All diets were iso nitrogenous and isocaloric to cover the nutrient requirements of chicks. Feed intake and body weight of chicks were recorded weekly. Feed conversion, body weight gain and economical efficiency were calculated.

Data collection, sampling and analysis:

At the end of the experiment, 9 birds were randomly chosen from each treatment, fasted overnight, weight and slaughtered to complete bleeding. Dressing, giblets (liver, heart and gizzard) were expressed relative to live body weight. Blood samples were taken at slaughter time from each bird into un-heparinized tubes, and blood serum samples were separated by centrifugation at 3500 rpm for 15 min. Concentrations of glucose, creatinine, total protein, and transaminases

(ALT and AST) were determined according to the methods of AOAC (2003).

Digestion trials were determined at 6-weeks old of Japanese quail in order to evaluate the nutrient digestion coefficients of the experimental diets. Five birds from each treatment were placed in a separate battery. The collection period lasted for 3 days, and the excreta were collected daily after being sprayed with 2% boric acid to prevent any loss of ammonia, then dried in an oven at 60°C and weighed after dried then grinded well according to the procedure described by Jakobsen et al. (1960). Chemical analyses of the experimental diets and dried excreta were carried out according to the official methods of analysis (AOAC, 2003). Digestibility of nutrients were calculated for dry matter (DM), organic matter (OM), crude protein (CP), crude fiber (CF), ether extract (EE) and nitrogen-free extract (NFE).

To determine the economical efficiency (EEf) of the diets for meat production, the management factors in all dietary treatments were stabilized. The price of the experimental diets was calculated of the local market at the time of the study. So, the cost of feed consumed of each treatment was easy to be calculated. The EEf was calculated as the feed cost needed to one bird.

Statistical analyses:

The statistical analysis for the Data were performed by using the general linear model (GLM) procedures according to SAS, (2009) and the significant mean differences among treatments means were determined using Duncan's Multiple Rang test (Duncan, 1955). The statistical model used was as follows:

Y_{ij} = u+ ai + Eij, where:

Y_{ij} = an individual observation,

u= overall mean.

a_i = effect of treatment (i = 1, 2,3) and

E_{ij} = the experimental error.

RESULTS AND DISCUSSION

Growth performance:

Body weight gain, feed intake and feed conversion through the whole experimental period (1-6 wks. of age) are shown in Table 3. Results showed that quail chicks fed DDGS had the highest (P≤0.05) body weight, body weight gain and feed intake while, there was no significant effect on feed conversion ratio compared to the control group . Increasing body weight gain may be related to increasing feed intake, this is in agreement with Ghazalah et al .(2012) who used DDGS in broiler diets and cleared that there was significant effect (P≤0.05) on body weight gain and body weight. However, showed no significant effect on feed intake and feed conversion. Wang et al. (2008) used DDGS in broiler diets at levels 0, 10, 20, 30, 40 and 50% he showed that at 14 d post hatch, the higher levels of DDGS numerically reduced the body weight at 35, 42 and 49 d, being reduced gradually as DDGS increased.

Blood parameters

Results of blood parameters are presented in Table 4. It could be summarized that $T_1$and T_2 had the higher and significant (p<0.05) value of total plasma protein, globulin concentrations; and lower activities of AST and ALT than the control group . Similarly, Gabr et al. (**2008)** showed that AST and ALT were not significantly affected by dietary contained 10, 15 and 20% DDGs.

Carcass traits:

Carcass traits relative to the pre-slaughter weight of quail as affected by DDGS are recorded in Table 5. Data cleared that there were no significant differences (p<0.05) related to DDGS level on dressing weight, heart weight, liver weight, and gizzard weight. These results are similar to those reported by Lumpkins et al., (2004) who formulated diets contained 0, 6, 12, or 18% DDGS and cleared that there were no differences significantly in carcass yield or performance during the whole experiment. Also, our results are in agreement with those obtained by Wang et al., (2007a, b) who showed that there were no effects on carcass quality as fed broilers on diets containing up to 15%. DDGS.

Nutrient digestibility:

The effect of treatments on nutrient digestibility is revealed in Table 6. Results cleared that digestibility of OM, EE, CF and NFE of quail birds were insignificantly affected by DDGS inclusion. However, there were significant differences ($p<0.05$) among experimental treatments in CP, where T_2 (complete substitution 100% DDGS for yellow corn) had lowest CP digestibility than control which may be related to decreasing the nutritive value of DDGS. These results are similar to those obtained by Ghazalah et al. (2012) who found that CP digestibility decreased with increasing DDGS levels of Japanese quail birds. Also, Shalash et al. (2010) showed that there were no significant effects on nutrients digestibility due to feeding laying hens on diets containing different levels of DDGS.

Economical efficiency:

The data recorded in Table 7 showed that the highest economical efficiency values were obtained with the diet of T_1 and T_2 fed DDGS at 50 and 100% of YC. This result is similar to that of Choi et al. (2008) who cleared that the cost of feed decreased as increasing DDGS levels in broiler diets without negative effects on the performance.

CONCLUSION

According to data obtained, characteristics and economical efficiency, it could be concluded that quails chicks can feed different levels of DDGS up to 100% as substitute of yellow corn with no adverse effect on quail performance, blood parameters, and carcass characteristics.

It can be observed that, the experimental diets were different at the level of other components which affect the results. Also, the results of this study related to nature and level of diet components beside DDGS.

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

Ingredients	Experimental diets		
	Control	**50 %DDGS**	**100 % DDGS**
Yellow corn	60.00	30	---
Soybean meal (44%)	28.00	28	15
DDGS	---	30	60
Corn gluten (60%)	9.20	2.3	---
Vegetable oil	---	5.4	12
Wheat bran	---	---	6.7
Calcium carbonate	0.50	2.00	2.00
Sodium chloride	0.30	0.30	0.30
Vit and mineral premix[1]	0.30	0.30	0.30
Di- Ca phosphate	1.00	1.00	1.00
DL-methionine[2]	0.20	0.20	0.20
Lysine	0.50	0.50	0.50
TOTAL	100	100	100
Calculated analysis[3]			
Crude protein %	22.8	23.33	23.00
ME (kcal/kg)	2990	2969	2955
phosphorus, %	0.31	0.34	0.36
Methionine	0.42	0.44	0.45

[1]vitamin and mineral premix. Each 3 kg of vitamin and minerals mixture contain: Vit A 10.000.000 IU. Vit. D3 2,000,000 IU. Vit E 10,000 mg. vit k 1.000 mg vit B1 1.000 mg, vit B2 5,000 mg , vit B6 1,500 mg, Vit B12 10 MG. Niacin 20.000 mg. Pantothenic acid 10.000 mg. Folic acid 1.000 mg. Biotin 50 mg. Choline chloride 500.000 mg. Copper 4.000 mg. Iodine 300 mg. iron 30.000 mg. Manganese 60.000 mg. Cobalt 100 mg. and Selenium 100 mg.
[2]DL- methionine: 98 % feed grade (contained 98 % methionine).
[3]Calcaulated according to NRC (1994).

Table (2): The chemical composition of the distillers dried grains with soluble (DDGS).

Composition	**%**
Dry matter, DM	92.2
ME (Kcal/Kg)	2480
Crude protein	26.00
Crude fiber	7.30
Crude fat	17.70
Ca	0.06
P	0.39

Table (3): Effect of DDGS on growth performance at 42 days of age.

Items	Dietary treatments			Sig.
	Control	T_1	T_2	
Initial body weight,(g)	8.6 ± 0.11	9.1 ± 0.13	9.2 ± 0.13	NS
Final body weight,(g)	200^b ± 0.32	216^a ± 0.15	218^a ± 0.25	*
Body weight gain,(g)	191.4^b ± 0.15	206.9^a ± 0.42	208.8^a ± 0.32	*
Feed intake,(g/bird)	780 ± 0.31	790 ± 0.11	810 ± 0.13	NS
Feed conversion,(g feed/g gain)	4.08± 0.12	3.82 ± 0.36	3.88 ± 0.35	NS

Means within the same row with different superscripts are significantly different (P≤0.05).

Table (4): Effect of DDGS on some blood plasma constituents.

Items	Dietary treatments			Sig.
	Control	T_1	T_2	
Total protein, (g/dl)	3.11^b ± 0.01	3.75^a ± 0.03	4.22^a ± 0.11	*
globulin, (g/dl)	1.65^b ± 0.03	1.92^b ± 0.04	2.61^a ± 0.05	*
Creatinine, (mg/dl)	1.23 ± 0.01	1.08 ± 0.03	1.12 ± 0.01	NS
Glucose, (mg/ dl)	206 ± 3.03	194 ± 5.08	203 ± 4.01	NS
AST,(U/ L)	11± 0.11	10.3± 0.01	10 ± 0.02	NS
ALT,(U/ L)	9 ± 0.23	8 ± 0.01	8.1 ± 0.01	NS

Means within the same row with different superscripts are significantly different (P≤0.05).

Table (5): Effect of DDGS on carcass characteristics of Japanese quail.

Items	Dietary treatments			Sig.
	Control	T_1	T_2	
Pre-slaughter weight,(g)	182.2 ± 0.51	200 ± 0.31	205.5 ± 0.45	NS
Dressing, %	66.7 ± 0.33	70 ± 0.21	67.7 ± 0.32	NS
Liver,%	1.53 ± 0.01	1.25 ± 0.03	1.21 ± 0.02	NS
Heart,%	0.35 ± 0.05	0.40 ±0.01	0.42 ± 0.01	NS
Gizzard,%	1.53 ± 0.01	1.37 ±0.02	1.48 ± 0.02	NS

Table (6): Effect of DDGS levels on nutrients digestibility.

Items	Dietary treatments			Sig.
	Control	T1	T2	
OM	90.1±2.03	89.9±2.11	90.2±2.55	NS
CP	85.9^{a}±2.01	82.9^{b}±2.03	81.8^{c}±2.31	*
EE	76.9±1.89	75.9±1.96	75.8±1.56	NS
CF	24.9±1.78	24.8±1.89	23.4±1.42	NS
NFE	87.8±1.56	87.3±1.78	86.9±1.35	NS

Means within the same row with different superscripts are significantly different ($P \leq 0.05$).

Table (7): The economical efficiency of the experimental diets.

Items	Dietary treatments		
	Control	T_1	T_2
Price/ kg feed, (L.E)*	5.20	4.50	4.10
Total Feed intake, (Kg/ bird)	0.780	0.790	0.810
Total feed cost. (L.E./ bird)	4.06	3.56	3.32
Price of one bird .(L.E.)**	10	10	10
[1]Net revenue. (L.E.)	5.94	6.44	6.68
[2]Economic efficiency	1.46	1.81	2.01
Relative economic efficiency, (%)	100	124	138

*According to the price of different ingredients available in the market 2015.
** According to the local market price 2015.
[1]Net revenue= price of one quail – total feed cost /quail.
[2]Economic efficiency = (net revenue / feed cost) × 100.

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الملخص العربي

استبدال الذرة الصفراء بالمنتجات العرضية الجافة لتقطير الحبوب بالسوائل فى علائق كتاكيت السمان

نعمات محمود العبد

قسم التنمية المتواصلة للبيئة –معهد الدراسات والبحوث البيئية-جامعة مدينة السادات - مصر

تضمنت هذه الدراسة تجربة لبحث تأثير استبدال الذرة الصفراء بالمنتجات العرضية الجافة لتقطير الحبوب بالسوائل فى علائق كتاكيت السمان على أداء النمو وصفات الذبيحة وبعض مكونات الدم. وكذلك هضم المركبات الغذائية.

حيث استخدم فى هده الدراسة 180 كتكوت سمان عمر يوم تم تقسيمها الى3 مجاميع تم تقسيمها بشكل عشوائى حيث اشتملت كل مجموعة على 60 كتكوت موزعة على 3 مكررات بكل مكررة 20كتكوت .

تم استخدام 3مستويات من المنتجات العرضية الجافة لتقطير الحبوب بالسوائل وهى صفر، 50%، 100% كبديل للذرة الصفراء.

ويمكن تلخيص أهم النتائج التي تم التوصل إليها فيما يلي:

1-تحسن معنوي في وزن الجسم ومعدل الزيادة في وزن الجسم.

2-تحسن غير معنوي في معدل التحويل الغذائي بالمقارنة بمجموعة المقارنة خلال فترة التجربة

3-حدوث تحسن غير معنوي في وزن الذبيحة وكذلك الأجزاء المأكولة بالمقارنة بالكنترول.

4-تحسن معنوي في مستوى بروتينات سيرم الدم و ALT , AST مقارنة بالكنترول.

5-فيما عدا قيم معاملات هضم البروتين الخام لم يكن هناك تاثير للمستويات المختلفة من المنتجات العرضية الجافة لتقطير الحبوب بالسوائل على قيم معاملات هضم المركبات الغذائية.

6-من الناحية الاقتصادية حققت التغذية على المنتجات العرضية الجافة لتقطير الحبوب بالسوائل نتيجة ايجابية

ومن تلك الدراسة نستنتج ان العلائق كانت مختلفة في مسنوى مكونات أخرى قد يكون لها تاثيرها على النتائج وبالتالي فان الاستنتاجات لهذا البحث تتوقف على طبيعة ومستوى مواد العلف الأخرى التي تدخل الى جانب الDDGS