Zagazig J. Agric. Res., Vol. 47 No. (5) 2020 1213-1220

Animal, Poultry and Fish Production Research
Available online at http://zjar.journals.ekb.eg
http:/www.journals.zu.edu.eg/journalDisplay.aspx?Journalld=1&queryType=Master

EFFECT OF RICE BRAN OIL ON GROWTH PERFORMANCE, CARCASS TRAITS AND BLOOD CHEMISTRY OF BROILER CHICKENS

Wesam Kh. Metwally, M.M. El-Hindawy, E.A. Ashour and M.M.I. Alagawany*

Poult. Dept., Fac. Agric., Zagazig Univ., Egypt

Received: 09/08/2020 ; Accepted: 09/09/2020

ABSTRACT: The current study aimed to investigate the impacts of different gradual levels of rice bran oil (RBO) on the growth rate, carcass traits and blood parameters of broilers. A total of 160 unsexed chicks seven-days old were randomly divided into four treatment groups. The treatments were 0 (control), 0.4, 0.8 and 1.2% rice bran oil. The results showed that rice bran oil had significant effects on live body weight (LBW) and body weight gain (BWG) at all studied ages. Apart from feed intake (FI) at 1-5 wks of age, significant ($p < 0.05$) impacts were observed in FI due to RBO. Use of RBO in the diet did not affect feed conversion ratio (FCR) of chicks at all ages. All carcass traits including carcass, dressing and giblets yields were statistically ($p < 0.05$) affected by RBO. Apart from total protein and globulin, RBO did not affect ($P>0.05$) all liver and kidney functions. It could be concluded that use of RBO at 0.8 g/kg diet caused some deleterious effects on the performance and carcass traits; but the use of RBO at all different levels in broiler diets did not affect most of blood parameters.

Key words: Broilers; rice bran oil, performance, carcass, blood**.**

INTRODUCTION

Poultry products such as eggs and meat have a good role in human feeding. People have become more attention to the quality of their food in recent years. Because growing nation request for animal origins soft in fat and cholesterol, studies have been focusing on improving the quality of foods from animal origin (**Hargis and Van Elswyk, 1993; Zeweil *et al.*, 2013; Ismail *et al.*, 2020**).

Rice is the principle cereal food in Egypt, and the by-products from its milling are used as important feed resources. Rice bran, a by-product of rice milling, contains high levels of important nutrients, such as proteins, vitamins, minerals, complex carbohydrates, phytonutrients, phospholipids and essential fatty acids (**Hamada, 2000; Ryan *et al.*, 2011**). Rice bran is an effective dietary energy and unsaturated fatty acid source for animals such as chickens. Generally, fat supplements are put in the chicken diets to raise the intake from the vitamins and promote egg and meat products. Digestibility of dietary fats is influenced by the fatty acid (FA) content (**Ravindran *et al.*, 2016**). Many researchers have shown better usage of unsaturated fats, serious to higher metabolizable energy for unsaturated fats than for saturated fats (**Craspo and Esteve-Garcia, 2001; Kang and Kim 2016**). Rice content of crude rice bran oil like unsatturated fat, which consists of 41% monounsaturates (39% oleic acid), 36% polyunsaturates (34% linoleic acid) and 19% saturates (**Kahlon *et al.*, 1992a**). Rice bran oil included upon 4% of unsaponifiable material (**Sharma and Rukmini, 1986**). Oryzanol, a mix of ferulic sour esters of triterpenoid alcohols, contain of 20% to 30% of unsaponifiable matter and 1.1% to 2.6% of bran oil. Oryzanol is antioxidant complex and is also related with depressing plasma cholesterol (**Yoshino *et al.*, 1989**). **Xu *et al.* (2001)** illustrated that gamma oryzanol has antioxidant action in the restraint of cholesterol corrosion. There are many cases on nations and animals aspect that oryzanol have cholesterol decreasing

* **Corresponding author: Tel. :** +201014990717
E-mail address: dr.mahmoud.alagwany@gmail.com

property (**Sharma and Rukmini, 1986; Kahlon *et al.*, 1992b**). The structure of rice bran oil is fully cited (**Patel and Naik, 2004**), in regard of its scope; plant oil is a source of energy, contains main fatty acids and may be improved through adding to meat and laying hens ration. RBO has an excellent fatty acid profile. Three major fatty acids, palmitic, oleic, and linoleic account for 90% of the total fatty acids of rice bran extract (**Patel and Naik, 2004**). Previous studies on dietary supplementation of rice bran oil in broilers improved growth performance (**Purushothaman *et al.*, 2005; Anitha *et al.*, 2006; Kang and Kim, 2016**) and decreased cholesterol concentrations (**Berger *et al.*, 2005**). Dietary supplementation of rice bran in mice has improved immune response (**Henderson *et al.*, 2012**). However, results pertaining to the effects of dietary supplementation of RBO on the growth performance, blood parameters, and immune response of broiler are limited. Therefore, the aim of the current study was to determine the effect of dietary supplementation of rice bran oil on growth performance, carcass traits and blood chemistry of broilers.

MATERIALS AND METHODS

Birds, Experimental Design and Diets

The present experiment was carried out at Poultry Research Farm, Poultry Department, Faculty of Agriculture, Zagazig University, Zagazig, Egypt. All experimental procedures were carried out according to the Local Experimental Animal Care Committee, and approved by the ethics of the institutional committee of Poultry Department, Faculty of Agriculture, Zagazig University, Zagazig, Egypt. A total number of 160 unsexed broiler chicks one week old with initial body weight of 183.03±0.01 g were used in a complete randomized design experiment with four treatments; 40 chick in four replicates (4×4×10). Chicks were housed in galvanized wire cages (40 cm high × 50 cm width × 100 cm length) with ten chicks each. Dietary treatments were as follows: 1) control (basal diet); 2) basal diet + 0.4 g RBO/kg diet); 3) (basal diet +0.8 g RBO/kg diet); 4) (basal diet+1.2 g RBO /kg diet). Each group of broiler chicks was fed the experimental diet (in mash form) from 1-5 weeks of age. The experimental diets were fed in 2 phases: starter (1-3 wk) and finisher (3-5 wk). Feed and water were offered *ad-libitum* through the experimental period. All chicks were kept under the same hygienic, managerial and environmental conditions. Chicks were fed to cover their requirements according to **NRC (1994)**. The formulation and composition of commercial broiler diets are shown in Table 1.

Trait Measurements

Growth performance parameters

Birds were weighed individually at weekly intervals. Average daily feed intake (ADFI), body weight gain (BWG) and feed conversion ratio (FCR) were calculated from these data by period and cumulatively. Feed wastage was recorded daily and the data were used to estimate feed consumption.

Carcass traits

Four birds were randomly selected around the mean of treatment for carcass evaluation. The carcasses were weighed and the weights of the liver, gizzard and heart were recorded and expressed as g/kg of slaughter weight (SW). Carcass, dressed and giblets weights expressed as percent of live weight (dressed weight = carcass weight plus giblets weight)/ live body weight×100.

Blood parameters

Blood samples were collected from sacrificed four broiler chicks for each treatment group in clean sterile tubes. Samples were let to coagulate and centrifuged at 3500 rpm (G- force value = 2328.24) for 15 minutes to obtain serum and serum samples were kept in Eppendorf tubes at -20°C until analysed. The following serum biochemical parameters were determined: total protein (TP), albumin (ALB), aspartate aminotransferase (AST), alanine aminotransferase (ALT), creatinine, and urea levels were determined spectrophotometrically using commercial diagnostic kits provided from Biodiagnostic Co. (Giza, Egypt).

Statistical Analysis

The differences among groups were statistically analysed by one-way ANOVA using **SPSS (2008)** statistical software package for windows version 11.0. The significant variation inter group means were detached by Duncan's Multiple Range-test (**Duncan, 1955**).

Table 1.Composition and nutrient content of experimental diets (as-fed basis) (starter-1-21 day)

Item	Basal diets	
	Starter	Finisher
Ingredient (%)		
Maize 8.5%	53.03	59.21
Soybean meal 44%	35.00	27.00
Maize gluten meal 62%	5.00	5.00
Soybean oil	2.90	4.82
Limestone	1.40	1.37
Di-calcium phosphate	1.50	1.55
Salt	0.30	0.30
Premix[1]	0.30	0.30
L-Lysine	0.15	0.15
Dl-Methionine	0.12	0.00
Choline chloride (50%)	0.30	0.30
Total	100	100
Calculated composition (%)		
ME, Kcal/Kg	3000	3200
Crude protein	23.01	20.00
Calcium	1.02	1.00
Nonphytate P	0.45	0.45
Lysine	1.32	1.10
TSAA	0.92	0.72

[1]Provides per kg of diet: Vitam. A, 12,000 I.U; Vitam. D3, 5000 I.U; Vitamin E, 130.0 mg; Vitam. K3, 3.605 mg; Vitamin B1 (thiamin), 3.0 mg; Vitam. B2 (riboflavin), 8.0 mg; Vitam. B6, 4.950 mg; Vitam. B12, 17.0 mg; Niacin, 60.0 mg; D-Biotin, 200.0 mg; Calcium D-pantothenate, 18.333 mg; Folic acid, 2.083 mg; manganese, 100.0 mg; iron, 80.0 mg; zinc, 80.0 mg; copper, 8.0 mg; iodine, 2.0 mg; cobalt, 500.0 mg; and selenium, 150.0 mg.

RESULTS AND DISCUSSION

Effect of Rice Bran Oil on Growth Performance

The effects of rice bran oil (RBO) supplementation on growth performance of broiler chicks during the experiment are shown in Table 2. There were statistical differences ($P \leq 0.05$) in LBW and BWG due to treatments at all studied periods except BWG at 1-5 wks of age which was not significantly ($P \geq 0.05$) affected by different levels of RBO. The highest value of BW was observed in chicks fed RBO at level of 1.2 g/kg diet at 5 weeks of age compared to untreated group and other levels of RBO. Our results are in agreement with **Purshothaman *et al.* (2000)** they found that dietary supplementation of rice bran or rice bran extracts has been reported to improve BW gain in broilers. This observable improvement in LBW may be due to its high concentrations of oryzanols, tocopherols, vitamin E, ferulic acid, phytic acid, lecithin, and inositol (**Sharma and Rukmini, 1986; Jo and Choi, 2010**). Advantages ofutilizing oils in broiler diet include increase in absorptionand digestion of lipoproteins, significance amount of necessary fatty acids (**Lesson and Summers, 2001; Rahimi *et al.*, 2011**). In addition, the

Table 2. Growth performance of growing broiler chickens as affected by dietary treatments during the experiment

Item	Rice bran oil (g/kg diet)				P-value
	0	0.4	0.8	1.2	
Body weight (g)					
1 wk	183.02±0.01	183.03±0.01	183.05±0.01	183.03±0.01	0.179
3 wk	1026[a]±14.52	1006[a]±6.66	921.6[b]±7.26	1005[a]±5.00	<0.001
5 wk	2063[a]±8.81	2049[a]±18.33	2001[b]±2.72	2067[a]±3.92	0.008
Body weight gain (g)					
1-3 wk	46.93[a]±0.69	45.98[a]±0.31	41.93[b]±0.34	45.90[a]±0.23	<0.001
3-5 wk	74.04±0.85	74.45±1.06	77.14±0.32	75.90±0.26	<0.054
1-5 wk	60.49±0.26	60.21±0.60	59.53±0.02	60.98±0.10	0.099
Feed intake (g)					
1-3 wk	60.92[a]±0.88	59.65[a]±0.39	54.68[b]±0.32	59.96[a]±0.28	<0.001
3-5 wk	122.88[b]±0.64	122.09[b]±1.63	127.45[a]±1.44	125.71[ab]±0.77	0.044
1-5 wk	91.90±0.13	90.87±0.75	91.06±0.67	92.84±0.33	0.109
Feed conversion ratio (g feed/ g gain)					
1-3 wk	1.29±0.01	1.29±0.001	1.30±0.01	1.30±0.01	0.076
3-5 wk	1.65±0.012	1.64±0.02	1.65±0.01	1.65±0.01	0.778
1-5 wk	1.51±1.009	1.50±0.02	1.52±0.01	1.52±0.01	0.477

Means in the same raw with no superscript letters after them or with a common superscript letter following them are not significantly different (P≥0.05).

favourable results of vegetable oil diet on growth performance of birds could be explained by the positive effect of these fat sources on the reduced passage rate of the digesta through the gastrointestinal tract, allowing for better nutrient (**Kang and Kim, 2016**).

Significant ($p \leq 0.05$) impacts were observed in FI between treatments during all the different experimental periods except FI at 1-5 wks of age which insignificantly (P>0.05) affected by different levels of RBO. During the whole period (1-5 wks of age), the highest feed intake was recorded in chicks fed RBO at level 1.2 g/kg diet, while the lowest feed intake was recorded with the group fed diet at level of 0.4 g/kg. Effects of RBO supplementation on FCR were not significant in the present experiment during the different experimental periods. The best FCR was recorded in chicks fed RBO at level of 0.4 g/kg, while the worst FCR was recorded with the group fed other levels and control diet. These results partly agree with the findings of **Kang and Kim (2016)** who found that there was no effect of inclusion level of RBO in diets on feed intake of birds put our findings disagree with the results of **Kang and Kim (2016)** who reported that with inclusion level of RBO a tendency for improved feed conversion ratio was observed as inclusion level of RBO in diets increased.

Carcass Characteristics

The effect of dietary supplementation with rice bran oil on carcass traits at the end of

experimental period is presented in Table 3. Results indicated that carcass, dressing and giblets percentages were statistically significant ($p \leq 0.05$) differed due to the dietary treatments. The highest percentage of carcass and dressing was recorded in chicks fed RBO at level 1.2 g/kg diet, while the lowest one was recorded with the untreated group and other levels, respectively. On the contrary, **Anitha *et al.* (2007)** found that the crude rice bran oil levels did not affect weights of carcass and giblets. These results are confirmed by the results obtained by **Purshothaman *et al.* (2000) and Raju *et al.* (2005)**.

Blood Biochemical Parameters

Biochemical blood parameters are usually related to bird health status (**Reda *et al.*, 2020**). These parameters are good indicators of nutritional, physiological and pathological status of the bird and have the potential of being used to elucidate the impact of nutritional factors and additives supplied in diet (**Reda *et al.*, 2020**). The effect of rice bran oil supplementation on serum biochemical parameters of broiler chicks is presented in Table 4. The changes in the levels of serum content of urea, creatinine and albumin in addition to the activity of alanine aminotransferase (ALT) and aspartate aminotransferase (AST) in broiler chicks were slight and insignificant when compared to control group, while the total protein and globulin were affected by the treatment. The highest values of TP and globulin were recorded in chicks fed diet supplemented with RBO (0.8 or 1.2 g/kg diet) when compared to control and 0.4 g/kg of RBO. These results are in agreement with the observation of the **Kang and Kim (2016)** who illustrated that AST, ALT, glucose, and albumin were not affected by inclusion of RBO in diets. Also, **Kang and Kim (2016)** showed that the lack of adequate data on the role of rice bran extracts in altering blood parameters in poultry requires further research.

Conclusion

From these results, it could be proposed that use of RBO at 0.8 g/kg diet caused some deleterious effects on the performance and carcass traits; but use of RBO at all different levels in broiler diets did not affect all blood biochemical parameters.

Conflicts of Interest

All authors declare that they do not have any conflicts of interests that could inappropriately influence this manuscript.

Table 3. Carcass traits and relative organs of growing broiler chickens as affected by dietary treatments during the experiment

Item	Rice bran oil (g/kg diet)				P-value
	0	0.4	0.8	1.2	
Carcass (%)	71.45^{b}±0.02	71.58^{b}±.01	71.65^{b}±0.02	72.25^{a}±0.12	<0.001
Dressing (%)	77.54^{b}±0.05	77.58^{b}±.02	77.59^{b}±0.02	78.15^{a}±0.12	0.001
Liver (%)	2.20±0.07	2.17±.04	2.10±0.012	2.07±0.04	0.198
Gizzard (%)	2.96^{a}±0.01	2.92^{b}±.02	2.90±0.011	2.91±0.013	0.053
Heart (%)	0.91±0.02	0.90±.02	0.93±0.018	0.91±0.02	0.942
Giblets (%)	6.01^{a}±0.05	6.04^{ab}±0.02	5.94^{b}±0.007	5.90^{b}±0.05	0.036

Means in the same raw with no superscript letters after them or with a common superscript letter following them are not significantly different (P≥0.05).

Table 4. Liver and kidney function of growing broiler chickens as affected by dietary treatments during the experiment

Item	Rice bran oil (g/kg diet)				P-value
	0	0.4	0.8	1.2	
TP (g/dL)	1.61[b]±0.04	1.45[c]±.027	1.83[a]±0.01	1.81[a]±0.02	<0.001
ALB (g/dL)	1.14±0.03	1.14±0.04	1.16±0.020	1.13±0.06	0.966
GLOB (g/dL)	0.47[b]±0.03	0.316[c]±0.03	0.67[a]±0.028	0.68[a]±0.06	0.001
AST (IU/L)	242±13.06	252±2.10	217±17.29	232±12.94	0.329
ALT (IU/L)	6.56±4.09	8.52±2.39	14.09±5.71	8.22±1.28	0.549
Creatinine (mg/dL)	0.46±.07	0.46±0.06	0.52±0.04	0.38±0.01	0.392
Urea (mg/dL)	5.19±.96	4.35±0.66	3.55±0.89	3.67±0.94	0.554

Means in the same raw with no superscript letters after them or with a common superscript letter following them are not significantly different (P<0.05).

TP: total protein; ALB: albumin GLOB: globulin; ALT: alanine aminotransferase; AST: aspartate aminotransferase.

REFERENCES

Anitha, B., M. Moorthy and K. Viswanathan (2006). Production performance of broilers fed with crude rice bran oil. Int. J. Poult. Sci., 5: 1046–52.

Anitha, B., M. Moorthy and K. Viswanathan (2007). Performance of broiler fed with crude rice bran oil. J. Poult. Sci., 44: 283-290.

Berger, A., D. Rein, A. Schafer, I. Monnard, G. Gremaud and P. Lambelet (2005). Similar cholesterol-lowering properties of rice bran oil, with varied ϒ-oryzanol, in mildly hypercholesterolemic men. Euro. J. Nutr., 44: 163–73.

Craspo, N. and E. Esteve-Garcia (2001). Dietary fatty acid profile modifres abdominal fat deposition in broiler chickens. Poult. Sci., 80: 71-78.

Duncan, D.B. (1955). Multiple Range and Multiple F tests. Biomet., 11: 1-42.

Hamada, J. (2000) Characterization and functional properties of rice bran proteins modified by commercial exoproteases and endoproteases. J Food Sci., 65: 305–10.

Hargis, P.S. and M.E. Van Elswyk (1993). Manipulating the fatty acid composition of poultry meat and eggs for health conscious consumer. World's Poult. Sci. J., 49:251-264.

Henderson, A.J., A. Kumar, B. Barnett and S.W. Dow (2012). Consumption of rice bran increases mucosal immunoglobulin a concentrations and numbers of intestinal lactobacillus spp. J. Med. Food., 15: 469–75.

Ismail I.E., M. Alagawany, A.E. Taha, N. Puvača, V. Laudadio and V. Tufarelli (2020). Effect of dietary supplementation of garlic powder and phenyl acetic acid on productive performance, blood haematology, immunity and antioxidant status of broiler chickens. Asian-Australas J. Anim. Sci. DOI: https:// doi.org/10.5713/ajas.20.0140.

Jo, I.H. and Y.H. Choi (2010). Optimization of ethanol extraction of ϒ-oryzanol and other functional components from rice bran. Kor. J. Food Preserv., 17: 281–89.

Kahlon, T.S., F.I. Chow, N.R. Sayre and A.A. Betschart (1992a). Cholesterol lowering in hamsters fed rice bran at various levels, defatted rice bran and rice bran oil. J. Nutr., 122: 513-519.

Kahlon, T.S., R.M. Saunders, R.N. Sayre, F.I. Chow, M.M. Chiu and A.A. Betschart (1992b). Cholesterol-lowering effects of rice bran and rice bran oil fractions in

hypercholesterolemic hamsters. Cereal Cheni., 69: 485-489.

Kang, H.K. and C.H. Kim (2016). Effects of dietary supplementation with rice bran oil on the growth performance, blood parameters, and immune response of broiler chickens. J. Anim. Sci. and Technol., 58:12, DOI 10. 1186/s40781-016-0092-6.

Lesson, S. and J.D. Summers (2001). Nutrition of the Chicken. 4th Ed. Ontario: Univ. Books, 413.

NRC (1994). Nutrient Requirements of Poultry, National Academy Press, Washington, DC, 9th Ed.

Patel, M. and S.N. Naik (2004). Gamma-oryzanol from rice bran oil: A Rev. J. Sci. Ind. Res., 63 (7): 569-578.

Purshothaman, M.R., P. Vasan, R. Ravi, B., M.M.R. Shothaman, P. Vasan, R. Ravi and B. Mohan (2000). Effect of palm oil, rice bran oil and tallow on broiler production. Souvenir, Lead Papers and Res. Abstracts in IPSACON, 52:104.

Purshothaman, M.R., P. Vasan, B. Mohan and R. Ravi (2005). Utilization of tallow and ricebran oil in feeding broilers. Ind. J. Poult. Sci., 40:175–78.

Rahimi, S., A.S. Kamran and M.A.K. Torshizi (2011). Omega-3 enrichment of broiler meat by using two oil seeds. J. Agrc. Sci. Tech., 13: 353–365.

Raju, M.V.L.N., S.V.R. Rao, K. Radhika and A.K. Panda (2005). Effect of amount and source of supplemental dietary vegetable oil on broiler chickens exposed to aflatoxicosis. British Poult. Sci., 46: 587-594.

Ravindran, V., P. Tancharoenrat, F. Zaefarian and G. Ravindran (2016). Fats in poultry nutrition: Digestive physiology and factors influencing their utilization. Anim. Feed Sci. Technol., 213: 1-21.

Reda, F.M., M.S. El-Kholy, M.E. Abd El-Hack, A.E. Taha, S.I. Othman, A.A. Allam and M. Alagawany (2020a). Does the use of different oil sources in quail diets impact their productive and reproductive performance, egg quality and blood constituents? Poult. Sci., 99:3511–3518.

Ryan, E.P., A.L. Heuberger, T.L. Weir, B. Barnett, C.D. Broeckling and J.E. Prenni (2011). Rice bran fermented with Saccharomyces boulardiigenerates novel metabolite profiles with bioactivity. J. Agric. Food Chem., 59:1862–70.

Sharma, R.D. and C. Rukmini (1986). Rice bran oil and hypocholesterolemic in rats. Lipids., 21: 715–17.

SPSS (2008). Statistical Package for the Social Sciences, Ver. 17.0. SPSS Inc., Chicago, IL.

Xu, Z.M., N. Hua and J.S. Godber (2001). Antioxidant activity of tocopherols, tocotrienols, and gamma- oryzanol components from rice bran against cholesterol oxidation accelerated by 2,2'-azobis (2-methylpropionamidine) dihydrochloride. J. Agric. Food Chem., 49 (4): 2077-2081.

Yoshino, G., T. Kazumi, M. Amano, M. Takeiwa, T. Yamasak, S. Takashima, M. Iwai, H. Hatanaka and S. Baba (1989). Effects of gamma-oryzanol and probucol on hyperlipidemia. Curr. Therapy Res., 45: 975-982.

Zeweil, H.S., M. Mahmoud, T.A. Ebeid, W. Dosoky and S. Omar (2013). Laying performance and lipid peroxidation status in Japanese quail laying hens maintained at a high ambient temperature and fed vitamin A and Vitam. E- Supplemented diets. 19th Europ. Symposium on Poult. Nutr., 26-29 August, Potsdam, Germany.

تأثيـــر زيـت رجيـع الأرز علـى أداء النمـو وصـفات الذبيحة وقياسات الدم لبدارى التســمين

وسام خيرى متولي - محمد محمد الهنداوي - علوي علي عاشور- محمود محمد إبراهيم العجواني

قسم الدواجن – كلية الزراعة – جامعة الزقازيق – مصر

هدفت الدراسة الحالية إلي دراسة تأثير المستويات التدريجية المختلفة من زيت رجيع الأرز على معدل النمو وصفات الذبيحة وقياسات الدم في دجاج التسمين ، حيث تم استخدام ١٦٠ كتكوتاً غير مجنس عمر سبع أيام وتم توزيعها عشوائيا إلي أربع مجاميع علي النحو التالي (كنترول، ٠.٤، ٠.٨، ١.٢% زيت رجيع الأرز)، وتبين من خلال النتائج أن هناك تأثير معنوى لزيت رجيع الأرز على وزن الجسم الحى و الوزن المكتسب عند الأعمار المدروسة، بغض النظر عن الغذاء المأكول عند عمر ١ - ٥ أسبوع من العمر ، كان هناك تأثير معنوى على الغذاء المأكول، لم يؤثر استخدام زيت رجيع الأرز على معدل تحويل الغذاء عند جميع الأعمار ، تأثرت صفات الذبيحة المدروسة معنويا مع استخدام زيت رجيع الأرز بغض النظر عن البروتين الكلى والجلوبيولين، لم يؤثر زيت رجيع الأرز على وظائف الكبد والكلى، نستخلص مما سبق أن استخدام زيت رجيع الأرز عند مستوى ٠.٨% لكل كجم علف أدى الى بعض التأثيرات غير المرغوبة على الأداء وصفات الذبيحة ، ولكن استخدام زيت رجيع الأرز عند المستويات المختلفة لم يؤثر على معظم قياسات الدم.

المحكمـــون:

١- أ.د. خليـل الشحـات شريف أستاذ ورئيس قسم الدواجن – كلية الزراعة – جامعة المنصورة.

٢- أ.د. عادل إبراهيم عطية خير أستاذ الدواجن المتفرغ – كلية الزراعة – جامعة الزقازيق.