Egypt. Poult. Sci. Vol. (40) (IV): (883-894)(2020) **(2011-1123**

Egyptian Poultry Science Journal

http://www.epsj.journals.ekb.eg/

ISSN: 1110-5623 (Print) – 2090-0570 (Online)

EFFECT OF WOOD CHARCOAL AND VINEGAR MIXTURE SUPPLEMENTATION ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE AND INTESTINAL BACTERIAL COUNT FOR AGED LAYERS

Amany A. EL-Sahn ; Wesam A. Fares ; Mona R.M. Ahmed and Marwa R. EL-deken

Anim. Prod. Res. Inst., Agric. Res. Center, Min. of Agric, Egypt.

Corresponding Author: Amany EL-Sahn**;** Email: dr-amanyelsahn@yahoo.com

Received: 11/11/2020 Accepted: 17 /12/2020

ABSTRACT: The present study was conducted to investigate the influence of dietary supplementation wood charcoal and vinegar mixture on productive and reproductive performance, hatch traits and intestinal bacterial count for aged layers. A total number of 144 Gimmizah chickens (120 hens + 24 cocks) aged were individually weighed and randomly divided into four treatment groups. Each treatment group was represented by three replicates (10 hens + 2 cocks) and housed in 12 floor pens under open system conditions until the end of the experiment (64 weeks). The birds of the first group were served as control and the other groups were treated by 0·5, 1· 0 and 1·5 % of wood charcoal and vinegar mixture (CV) to be CV1, CV2 and CV3 groups, respectively. The obtained results represented enhancing in egg weight, egg mass and egg production % for all treated groups (CV1, CV2 and CV3) compared to control group. Also, the highest value of egg shell thickness was detected in CV3 group compared to the other groups. Dietary supplementation of CV had significant influence on total bacteria count of jejunum. Eggs produced from hens of CV2 and CV3 groups had significant increase of hatchability for fertile egg percentage compared to those of CV1 and control group. Birds of the CV3 group had the highest values of the plasma Ca, P and Glucose compared to those of other groups. In conclusion, supplementing the diet of layer with 1·5 % wood charcoal and vinegar mixture at late phase of production could be a promising tool for realizing the best improvement of egg production, egg shell thickness, hatchability% and jejunum bacterial count.

Keywords: Wood Charcoal,Vinegar, aged layers, egg production,egg shell,total bacteria count

INTRODUCTION

When hens get older, the eggs get larger, but the shell gland still deposits the same amount of calcium (Ca) on the shells, making them thinner, also, aged hens are less successful in absorbing Ca than younger ones (Al-Batshan et al., 1994). Most of research on nutritional effects on eggshell quality in laying hens have concentrated on dietary Ca manipulation as the primary means to improving the quality of the eggshell, but , increasing dietary Ca alone reportedly impairs the absorption of other minerals, such as phosphorus, magnesium, manganese, and zinc, causing secondary deficiencies, besides, excess calcium significantly reduces egg production, egg weight and feed consumption (Harms and Waldroup, 1971), eggshell thickness (Jiang et al., 2013) . Activated charcoal is a fine black powder formed from the decomposed material of various organic materials, which is then exposed to oxidizing gases at high temperatures to activate and increase the surface area (Clegg and Hope, 1999). Activated charcoal in general acts as an insoluble carrier that nonspecifically adsorbs molecules, thereby preventing their absorption (Anjaneyulu et al., 1993). Chen et al. (2017) reported that vinegar contains some vitamins and minerals which may be the reason of improving egg production and egg shell quality parameters. Dietary inclusion of organic acids is reported to decrease intestinal PH and increase Ca solubility, which increases Ca levels in blood and improves egg shell quality Rattanawut (2017). A mixed of charcoal powder and wood vinegar compounds has been used to produce high animal productions. The dietary addition of charcoal wood and vinegar compounds to diets induced a significant increase in hen-day egg production and feed conversion improvement (Sakaida et al., 1987a) and hatchability (Sakaida et al., 1987b). This study was performed to assess the influence of supplementation of wood charcoal and vinegar mixture on productive and reproductive performance and intestinal bacterial count of aged Gimmizah layers.

MATERIALS AND METHODS

Experimental design:

The present study was performed at EL-Sabahia Poultry Research Station, Animal Production Research Institute, Agriculture Research Center. A total number of 144 Gimmizah chickens (120 hens + 24 cocks) aged 52 week were individually weighed and randomly divided into four treatment groups. Each treatment group was represented by three replicates (10 hens + 2 cocks) and housed in 12 floor pens until the end of the experiment (64 weeks of age). The birds of the first group were served as control without any supplementation and the other groups were treated by 0·5, 1· 0 and 1·5 % of wood charcoal and vinegar mixture (CV) to be CV1, CV2 and CV3 groups respectively. Sugarcane vinegar compound was absorbed into wood charcoal powder in the ratio of 1 L/2Kg. Composition of sugarcane vinegar are presented in Table (1) according to Sultan and Shehate (2012). Experimental diets were formulated according to Feed Composition Table for Animal and Poultry Feed stuffs in Egypt (2001) as shown in Table (2). The hens were fed a conventional layer mash. Feed and water were provided for chickens *ad- libitium* throughout the experimental period. Birds were subjected to 16 hrs light and 8 hrs dark during the experimental period.

Measurements:-

Feed consumption (g) was recorded for each bird every week for each treatment then calculated during the whole experimental laying period. Feed conversion ratio was calculated as amount of consumed feed (g/bird/day) required for producing a unit (g) of egg mass. At the end of experimental laying

period, egg weight (g), egg production % and egg mass (g/bird/day) were recorded. Five fresh eggs from each replicate were randomly chosen at the end of the experiment to estimate yolk, albumen and eggshell weight and egg shell thickness without membranes by micrometer to the nearest 0.01mm., Haugh unit score (HU) was calculated according to Haugh (1937) and egg shape index according to Ramanoff and Ramanoff (1949) and the yolk color was measured with the use of DSM Roche yolk color fan.

At 62 wks of age, one thousand hatching eggs produced from Gimmizah hens representing the four experimental groups were incubated in Egyptian made incubator at 99.5° F and 55% RH during setting phase of incubation, egg trays were randomly distributed in the incubator. At 18^{th} day of incubation, the eggs were candled and macroscopic fertility was calculated as the apparent percentage of fertile eggs from total setting eggs **(**Rizk et al., 2008). Also, eggs with evidence of living embryos were transferred to hatcher and incubated at 99° F and 70%RH. Hatchability of fertile eggs% was determined. Eggs that failed to hatch at the end of incubation and having full opportunity for hatching were broken out and then examined with naked eye to estimate embryonic mortalities % during intervals 1-7, 8-14 and 15-21 days of incubation. Body weights (g) for all hatched chicks at the time of removal from the hatcher were recorded and termed as chick weight at pull out.

Total bacteria count

At the end of the experiment, 3 hens from each replicate were randomly chosen and sacrificed for detection of total bacterial count intestinal jejunum. The samples were collected aseptically in sterile Mc carteny bottles and transported within 30 minutes to the Alexandria provincial laboratory of animal Health Research institute for detection of total bacterial count in Mac Conkey agar according to method of Buchannan and Gibbons (1985).

Blood samples

At the end of the experiment, in the morning at 09.00 to 10.00h, blood samples (3ml, each) were collected from the branchial vein, into heparinized tube to separate plasma of three birds / treatment. Plasma was immediately separated by centrifugation for 10 minutes at 3200 rpm. Some plasma criteria as total protein, albumin, globulin, glucose, cholesterol, uric acid, calcium, and phosphorus were determined using commercial kits.

Statistical analysis:

Data obtained were statistically analyzed using General Linear Models (GLM) of SAS (2004). The significant differences among treatment means were tested according to Duncan (1955). The flowing model was used

$Y_{ij} = \mu + L_i + e_{ij}$

Y_{ij} = observed traits

μ= the overall mean

L_i= effect of CV level (1,2,3,4)

e_{ij} = experimental random error.

RESULTS AND DISCUSSION

Productive performance:

Effects of supplementation of dietary Charcoal and Vinegar mixture (CV) supplementation on productive performance and jejunum total bacterial count for Gimmizah chickens are shown in Table (3). The statistical analysis showed no significant difference in the initial body weight among the experimental groups. Highest significant differences of BWC were existed for birds of control and CV1 groups compared with those for CV2 and CV3 groups. Moreover, Gimmizah chickens at late stage of egg production represented significant increase in egg weight (g) egg mass (g) and egg production% for all treated groups (CV1, CV2 and CV3) compared to control one. These significant increases showed

improvement with the increase of the charcoal and vinegar concentrations. In addition, hens of CV1, CV2 and CV3 groups significantly consumed less amount of feed compared to those for control group. Consequently, feed conversion had been improved for birds of treated groups compared to control group and the best ratio was observed for CV3 group as increased the supplementation percent of charcoal and vinegar. In same Table, it appears from data of this table that all bird groups represented significant decrease of jejunum total bacterial count due to the experimental supplementation charcoal and vinegar compared to control group.

In the results of BW, layers treated by CV had low BW, which are in agreement with those previously reported by Osteman et al. (2005) who found that acetic acid reduces BW by enhancing acidity and thus decreasing the total feed intake. Also, Chen et al. (2017) observed that vinegar alters the regulation of lipids, the long –term intake of vinegar should also have an effect on weight loss. Moreover, Kondo et al. (2009) found that acetic acid was considered to be the active ingredient in vinegar that effect reduction body fat and body weight gain. The results herein regarding the increase of egg production with increasing the dietary supplementation of CV are in line with those previously reported by Kutlu et al. (2001). Moreover, Rattanawut (2017) reported that egg production tended to be increased in the group of 0·5 and 1·0 % charcoal mixed with vinegar, but decreased in the 1·5 % charcoal mixed with vinegar group. Whereas Yamauchi et al. (2010) found that the mixed supplementation of charcoal and vinegar induced significant increase in egg production of laying hens and this increase could be due to the intestinal function stimulation. Furthermore, Lutz and Scharrer (1991) mentioned that acetic acid is one of the main short chain fatty acids produced by intestinal microbes, which can affect intestinal function and metabolism.

Feed intake reduction could be attributed to a high bulky density of charcoal and it is also possibly that the blacking of the feed by the charcoal might cause a degree of un palatability (Jindal et al., 1994) these factors may account for lowering feed intake in birds fed supplemental charcoal. Also, the increase of egg production could be the reason with the reduction of feed consumption for improving the feed conversion and this statement is in harmony with those reported by Choi and Koh (1991).

The results of jejunum total bacteria count decrease with dietary supplementation with CV are in accordance with those previously reported by Rattanawut (2017) who found that the level of 1· 0 % bamboo charcoal and bamboo vinegar in a layers diet is sufficient for decreasing pathogenic bacteria and stimulating intestinal function. Also, Sorrells and Specks (1970) reported that acetic acid play a role in controlling the balance of intestinal microbial and pathogen. Awad et al. (2009) found that beneficial feed additives to the diet can recover the intestinal integrity, improve gut health, and thus increase nutrient availability and absorption.

Egg quality:

Effects of dietary charcoal and vinegar supplementation on some egg quality traits are summarized in Table (4). Egg shell thickness, egg shape index and yolk color were significantly increased in all treated groups compared to the control. However, no significant differences were found between groups with respect yolk weight, albumen weight, egg shell percent and Haugh units. The positive effect of CV supplementation on egg shell quality could be attributed to the beneficial effect of charcoal and vinegar mixture in promoting intestinal function

which may help to assimilate the improvement of more nutrients Rattanawut (2017). The results of some experiments with layers and elder breeder hens have demonstrated that organic acids may improve the utilization of minerals and can positively affect egg shell quality (Park et al., 2002 and Sengor et al., 2007). Reducing gastrointestinal PH, which increases the activity of digestive enzymes and minerals solubility, is one contributing mechanism (Swiatkiewicz et al., 2010). Dietary of organic acid is also reported to decrease intestinal PH and increase Ca solubility, which increase Ca level in blood and improve egg quality (Abdel-Fattah et al., 2008; Soltan., 2008). Moreover, kim et al. (2006) resulted that addition of 0·5 or 1·0 % activated charcoal with wood vinegar in layer diet improved egg quality by means of enhancing egg shell thickness and yolk color.

Hatchability traits:

Data of Table (5) display the effect of dietary supplementation of charcoal and vinegar mixture on some hatching traits. Early and mid embryonic mortalities did not represent any significant change among the experimental groups. Whereas, late embryonic mortality was significantly decreased for eggs of CV3 group compared with control, CV1 and CV2 groups. Moreover, total embryonic mortalities were significantly reduced for CV2 and CV3 groups compared to control and CV1 ones. Whereas, Hatchability of fertile eggs percentage was significantly increased for eggs of CV2 and CV3 groups compared with those for CV1 and control groups. Furthermore, supplementing the diet of Gimmizah chickens with 1.5% mixture charcoal and vinegar for CV3 group had a significant increase of chick body weight at pull out compared with those for other rest groups. The obtained results of this study may shed some lights on the effect of this experimental supplementation on embryonic mortality and hatchability % and there is little actual data published to support this concept except that of Sakaida et al. (1987a) who assumed that the wood vinegar improved hatchability in breeder.

Blood parameters:

Effects of dietary supplementation with CV on serum parameters for Gimmizah chickens at the end of the experimental period are presented in Table (6). Statical analysis of the obtained data revealed linear significant increase of total protein, albumin, glucose, calcium and phosphorus concentrations with the increase level of CV in hen's diet besides significant linear decrease of serum uric acid and cholesterol concentrations in treaded groups compared with control one.

The results of the significant increase for total protein in treated groups is coincided with the pervious results reported by Arslan and Saatci (2004) who concluded that serum total protein concentration was significantly increased in Japanese quail received organic acid. Also, Yesilbag and Colpan (2006) reported that dietary organic acid supplementation either for 1 or 1·5 % significantly increased total serum protein and albumin concentration in laying hens. Moreover, Arun et al. (2006) stated that the serum concentration of protein and calcium were significantly increased due to dietary supplementation of Lactobacillus sporogenes to broiler diet.

Current data of the significant decrease of cholesterol of hens fed CV compared with control could be attributed to consuming acetic acid as mentioned by Abdo and Zeinb (2004) reported that blood cholesterol was significantly decreased by dietary acidifiers. Also, Fushimi et al. (2006). Found that the acetic acid of vinegar decreased fatty acid oxidation which inhibited lipogenesis in the liver and eventually decrease

cholesterol concentration. Supporting to these results Kim et al. (2006) found that laying hens fed CV tended to represent total cholesterol reduction.

The decrease of uric acid concentration in this study could refer to the better utilization of protein and amino acid digestibility. As, Sturkie (1986) reported that uric acid is the major end product of protein metabolism in poultry and organic acid addition significantly reduced serum concentration of uric acid. Moreover, Abdel-Fattah et al. (2008) found that uric acid in blood of broiler chicks were slightly affected by feeding diets containing 1·5 and 3·0% levels.

The results of significant increase in blood glucose with the increase of CV supplementation in diet are in harmony with that previously reported by Oso et al. (2014) who mentioned that broiler dietary supplementation of 6g/kg charcoal resulted in significant improvement of serum glucose concentration and it is indication of improvement in energy utilization as reported by (Rajman et al., 2006).

Referring to the increase of Ca and P concentrations in the data of this study could be due to the gastrointestinal pH reduction, which increases the activity of digestive enzymes and the solubility of minerals as previously explained by Swiatkiewicz et al. (2010). Dietary inclusion of organic acids is also reported to decrease intestinal pH and increase Ca and P solubility, which increases Ca and P levels in the blood (Abdel-Fattahet et al., 2008; Soltan, 2008).

Conclusion: it is concluded from the results of this study that supplementing the aged Gimmizah chickens with diet contains 1·5 % wood charcoal and vinegar mixture could be a solution for improving the egg production percentage, egg quality traits and some blood parameters as well as diminishing the total bacteria count.

Table (1): Analysis of organic acid in sugarcane vinegar.

Organic acid	Sugarcane vinegar mg/100ml
Oxalic	47.65
Citric	54.97
Acetic	6380.32
Ascorbic	20.05
Succinic	133.94

Table (2): Composition and analysis of the basal experimental layer diet

Ingredients	kg/Ton
Yellow corn (8.2 % CP)	663.30
Soybean meal (48% CP)	242.0
Limestone	75.00
Dicalcium phosphate	13.20
Vit+Min Premix[1]	2.50
Sodium chloride (NaCl)	2.50
DL-Methionine	1.50
Total	1000.00
Calculated analysis	
ME, Kcal/Kg	2777
CP, %	17.06
Ether extract , %	2.90
Crude fiber, %	4.10
Methionine, %	3.91
Meth.+Cys.(TSAA) %	0.67
Lysine, %	0.80
Calcium, %	3.10
Av.Phos,%	0.42
Chemical analysis (AOAC,2000)	
Dry matter, %	90.73
Crude protein, %	16.97
Ether extract , %	2.45
Crude fiber, %	3.96
Ash, %	6.37
Nitrogen free extract, (NFE) %	60.98

Vit+Min mixture provides per Kilogram of diet: Vit. A, 1200 IU; Vit. E, 10 IU; menadione, 3 mg; Vit. D_3, 2200 ICU; riboflavin, 10mg; Ca pantothenate, 10mg; nicotinic acid, 20 mg; Choline chloride, 500mg, Vit. $B_{12,}$ 0.01mg; Vit.$B_{6,}$ 1.5mg; Vit.$B_{1,}$ 2.2mg; Folic acid, 1mg; Biotin, 0.05mg. Trace mineral (milligrams per kilogram of diet) Mn.55; Zn. 50; Fe. 30; Cu. 10; Se. 0.10; Anti oxidant. 3m

Table (3): Effect of dietary Charcoal and Vinegar mixture supplementation on productive performance and jejunum total bacterial count for Gimmizah chickens (Means ±SE)
[a,b,c,d] means having different letters in the same row are significantly different (P≤0.05)

Items	Wood charcoal and Vinegar mixture (CV) %			
	Control	**CV1 (0·5)**	**CV2 (1· 0)**	**CV3 (1·5)**
Initial body weight (g)	1650.01 ±23.51	1666.67 ± 18.41	1660.01 ± 21.63	1658.67 ± 9.95
Body weight change (g)	173.67 ±7.91[a]	129.33 ± 8.72[b]	88.33 ± 6.80[c]	74.33 ± 5.85[c]
Egg weight (g)	54.16 ±0.04[d]	55.59 ± 0.13[c]	56.83 ± 0.15[b]	57.39 ± 0.12[a]
Egg mass (g/bird/ day)	24.05 ± 0.12[d]	28.94 ± 0.23[c]	30.64 ± 0.29[b]	33.22 ± 0.41[a]
Egg production (%)	44.40 ± 0.19[d]	52.06 ±0.54[c]	53.92 ± 0.46[b]	57.85 ± 0.60[a]
Feed consumption (g/bird/ day)	133.33 ± 1.17[a]	130.33 ± 0.21[b]	128.00 ± 0.36[c]	126.00 ± 0.63[c]
Feed conversion ratio (g feed/ g egg mass)	5.53 ± 0.07[a]	4.50 ± 0.03[b]	4.18 ±0.04[c]	3.81 ± 0.05[d]
Jejunum total bacteria count x 10^6	4.38 ± 0.03[a]	3.10 ±0.08[b]	2.63 ± 0.02[c]	1.50 ± 0.01[c]

Table (4) : Effect of dietary Charcoal and Vinegar supplementation on some egg quality traits of aged Gimmizah chickens (Means ±SE)

Items	Wood charcoal and Vinegar mixture (CV) %			
	Control	**CV1 (0·5)**	**CV2 (1· 0)**	**CV3 (1·5)**
Egg shell thickness (mm)	0.298 ± 0.18[c]	0.337 ± 0.72[b]	0.338 ± 0.68[b]	0.350 ± 0.64[a]
Egg shape index	77.84 ± 1.26[a]	75.17 ± 0.78 [b]	75.67 ± 0.67[ab]	75.95 ± 0.56[ab]
Egg shell weight %	10.35 ± 0.41	10.51 ± 0.44	10.98 ± 0.19	11.18 ± 0.27
Albumen weight %	56.70 ± 0.56	56.82 ± 0.72	56.04 ± 0.44	55.97 ± 0.33
Yolk weight %	32.94 ± 0.21	32.66 ± 0.62	32.96 ± 0.26	32.84 ± 0.31
Haugh unit	81.50 ± 2.72	82.50 ± 1.76	84.38 ± 1.55	85.11 ± 0.50
Egg yolk color	5.60 ± 0.16[b]	5.60 ± 0.16[b]	6.40 ± 0.16[a]	6.60 ± 0.16[a]

[a,b, c] means having different letters in the same row are significantly different (P≤0.05)

Table (5) : Effect of dietary Charcoal and Vinegar mixture supplementation on some hatching traits of Gimmizah chickens (Means ±SE)

Items	Wood charcoal and Vinegar mixture (CV) %			
	control	CV1 (0·5)	CV2 (1· 0)	CV3 (1·5)
Early embryonic mortality %1-7 day	2.31 ± 0.01	2.30 ± 0.02	2.21 ± 0.02	2.18 ± 0.04
Mid embryonic mortality %8-14 day	0.59 ± 0.09	0.61 ± 0.01	0.53 ± 0.04	0.58 ± 0.04
Late embryonic mortality %	5.06 ± 0.06^{a}	5.00 ± 0.02^{a}	4.99 ± 0.02^{a}	4.89 ± 0.03^{b}
Total embryonic mortality %15-21 day	7.96 ± 0.03^{a}	7.91 ± 0.08^{a}	7.73 ± 0.05^{b}	7.65 ± 0.05^{b}
Hatchability of fertile egg %	84.72 ± 0.01^{b}	84.99 ± 0.09^{b}	85.24 ± 0.06^{a}	86.22 ± 0.06^{a}
Hatched chick body weight at pull out (g)	38.33 ± 0.12^{b}	38.72 ± 0.22^{b}	38.88 ± 0.31^{b}	39.51 ± 0.32^{a}

^{a,b} means having different letters in the same row are significantly different (P≤0.05)

Table (6) : Effect of dietary Charcoal and Vinegar mixture supplementation on some blood biochemical constituents of Gimmizah chickens (Means ±SE)

Items	Wood charcoal and Vinegar mixture (CV) %			
	Control	CV1 (0·5)	CV2 (1·0)	CV3 (1·5)
Total protein, g/dl	± 0.01^{d} 5.40	5.60 ± 0.02^{c}	6.00 ± 0.02^{b}	6.40 ± 0.01^{a}
Albumen, g/dl	2.10 ± 0.02^{d}	2.40 ± 0.05^{c}	2.60 ± 0.05^{b}	2.86 ± 0.01^{a}
Globulin, g/dl	3.16 ± 0.01^{b}	3.30 ± 0.02^{a}	3.40 ± 0.01^{a}	3.53 ± 0.01^{a}
Cholesterols, g/dl	110.43 ± 0.11^{a}	107.00 ± 0.09^{b}	104.00 ± 0.09^{c}	100.90 ± 0.22^{d}
Uric acid mg/dl	4.67 ± 0.004^{a}	4.47 ± 0.004^{b}	4.16 ± 0.004^{c}	2.92 ± 0.020^{d}
Glucose, mg/dl	146.00 ± 1.21^{d}	153.40 ± 0.45^{c}	171.33 ± 0.38^{b}	179.30 ± 0.41^{a}
Calcium, mg/dl	13.92 ± 0.002^{d}	15.20 ± 0.02^{c}	15.83 ± 0.04^{b}	16.27 ± 0.01^{a}
Phosphorus, g/dl	6.03 ± 0.002^{d}	6.58 ± 0.002^{c}	6.73 ±0.002^{b}	6.78 ± 0.007^{a}

^{a,b,c,d} means having different letters in the same row are significantly different (P≤0.05)

REFERENCES

-Fattah, S.A.; El-Sanhoury, M.H.; El-Mednay, N.M.; and Abdel-Azeem, F., 2008. Thyroid activity, some blood constituents, organs morphology and performance of broiler chicks fed supplemental organic acids. Int. J. Poult. Sci. 7:215–222.

Abdo, M.; and Zeinb, A., 2004. Efficacy of acetic acid in improving the utilization of low protein – low energy broiler diets. Egypt. Poult. Sci. 24:123-141.

Al-Batshan, H.A.; Scheideler, S.E.; Black, B.L.; Garlich, J.D.; and Anderson, K.E., 1994. Duodenal calcium uptake, femur ash, and eggshell quality decline with age and increase following molt. Poult. Sci. 73:1590–1596.

Anjaneyulu, Y.; Rama Rao, P.; and Gopal Naidu, N.R., 1993. Experimental aflatoxicosis and its amelioration by activated charcoal in broiler chicken-study on performance and haematology. J. Vet. Anim. Sci. 24: 51-54.

Arslan, C.; and Saatci, M., 2004. Effect of probiotic administration either as feed additive or by drinking water on performance and blood parameters in Japanese quail. Archiv fur Geflugelkunde : 160-163.

Arun, K.; Savaram, V.; Rama Rao, P.; Mantana, V.L.; RajuSita, R.; and Sharma, R., 2006. Dietary supplementation of lactobacillus sporogenes on performance and serum biochemico - lipid profile of broiler chickens. J. Poult. Sci. 1346-7395.

Awad, W.E.; Ghareeb, K.; Abdel-Raheem, S.; and Bohm, J., 2009. Effect of dietary inclusion of probiotic and symbiotic on growth performance organ weight and intestinal histomorphology of broiler chickens. Poult. Sci. 88: 49-55.

Buchannan, R.E.; and Gibbons, N.E., 1985. Bergey's manual of determinative bacteriology.Vol. 1. 9th Edn., Williams and Wilkins Baltimore, USA.

Chen, J.; Tian, J.; Ge, h., Liu, R.; and Xiao, J., 2017. Effect of tetramthylpyrazine from Chinese black vinegar on antioxidant and hypolipidemia activitiesin HepGcells. Food and Chemical Toxicologe109: 930-940.

Choi, Y.S.; and Koh, T.S., 1991 . Effect Of diets containing ground charcoal poewder wood vinegar and fermented acetic acid on the egg production in white leghorn strain layer. Korea. J. Sci. 33: 33-42.

Clegg, T.; and Hope, K., 1999. The first line response for people who self poison: exploring the options for gut decontamination. Journal of Adv. Nursing 30:1360_1367.

Duncan, D. B., 1955 . Multiple range and F. test. Biometrics 11:1-42.

Feed Composition Table for Animal and Poultry Feed stuffs in Egypt 2001. Technical bulletin, Central lab. For Feed and food ; Ministry of Agriculture.

Fushimi, T.; Suruga, K.; Oshima, Y.; Fukiharu, M.; Tsukamoto, Y.; and Goda, T., 2006. Dietary acetic acid reduces serum cholesterol and triacylglycerols in rats fed a cholesterol-rich diet. Br. J. Nutr., 95, 916–924.

Harms, R.H.; and Waldroup, P.W., 1971 . The effect of high dietary calcium on the performance of laying hens. Poult Sci. 50:967–969.

Haugh, R.R., 1937. The Haugh unit for measuring egg quality. United States Egg Poultry Magazine 43:552-555.

Jiang, S.; Cui, L.; Shi, C.; Ke, X.; Luo, J.; and Hou, J., 2013 . Effects of dietary energy and calcium levels on performance, egg shell quality and bone metabolism in hens. Vet. J. 198:252–258.

Jindal, N.; Mahipal, S.K.; and Mahajan, N.K., 1994 . Toxicity of aflatoxin B1 in broiler chick and its reduction activated charcoal. Res. Vet. Sci. 56: 37-40.

Kim, K. E.; You, J.; Ahn, B.K.; Jo, T. S.; Ahn, B. J.; Choi, D. H.; and Kang, C.W., 2006 . Effect of dietary activated charcoal mixed wood vinegar on quality and chemical composition of egg in laying hens. J. Anim. Sci. Technol. (Kor). 18: 59-68.

Kondo, T.; kishi, M.; Fushimi, T.; Ugaji, N.; and Kaga, T., 2009. Vinegar intake reduces body weight, body fat mass, and serum triglyceride levels in obese Japanese subjects. Bioscience, Biotechnologe and Bio chemistry 73(8): 1837-1843.

Kutlu, H.R.; Unsal, I.; and Gorgulu, M., 2001. Effects of providing dietary wood (oak) charcoal to broiler chicks and laying hens. Anim Feed Sci. Technol. 90: 213-226.

Lutz, T.; and Scharrer, E., 1991. Effect of short-chain fatty acids on calcium absorption by the rat colon. Exp. Physiol.76:615–618.

Oso, A.; Oakapo, O.; Sanwo, K.; and Bamgbose, A.M., 2014 . Utilization **of** unpeeled cassava (Manihot esculenta crantz) root meal supplemented with or without charcoal by broiler chickens. J. Anim physiol. Anim .Nutr. 98: 431-438.

Ostman, E.; Granfeldt, Y.; Persson, L.; and Bjorck, I., 2005. Vinegar supplementation lowers glucose and insulin responses and increases satiety after abread meal in heath subjects. European Journal OF Clinical Nutrition. 59 (9): 983-988.

Park, J.H., Park, G.H.; and Ryu, K.S., 2002. Effect of feeding organic acid mixture and yeast culture on performance and egg quality of laying hens. Korean. J. Poult. Sci. 29:109–115.

Rajman, M.; Jurani, M.; Lamosova, D.; Macajova, M.; Sedlackova, M.; Kostal, I.; Jesova, D.; and Vyboh, P., 2006 . The effect of feed restriction on plasma biochemistry in growing meat typechickens (Gallus gallus). Comparative Biochemistry and Physiology. 145:363-371.

Rattanawut, J., 2017. Effects of dietary bamboo charcoal powder including bamboo vinegar supplementation on performance, egg shell quality, alteration of intestinal villi and intestinal pathogenic bacteria populations of aged laying hens. Italian J**.** Anim. Sci. 16:2

Rizk, R.E.; Nadia, A. EL-Sayed.; Shahein, E.H.A.; and Hedaia M. Shalan., 2008. Relationship between eggshell membranes and embryonic development through different egg production periods in two developed chicken strains. Egypt. Poult. Sci. 28: 535- 551.

Romanoff, A.L.; and Romanoff, A.J., 1949 . The avian egg. John Wiley and Sons. Inc. New York, USA.

Sakaida, T.; Enya, K.; and Tanaka, T., 1987a . Effects of the wood vinegar compound on egg production and egg quality of white leghorn hens. Japanese. Poult. Sci. 24: 44-49.

Sakaida, T.; Enya, K.; and Tanaka, T., 1987 b . Effects of the wood vinegar compound on hatchability of breeder. Japanese. Poult. Sci. 24: 374-377.

SAS., 2004. SAS\STAT Users Guide. Version 9.1 . SAS Inst. I.C., Carry,Nc,USA.

Sengor, E.; Yardimci, M.; Cetingul, S.; Bayram, I.; Sahin, H.; and Dogan, I., 2007. Effects of short chain fatty acid (SCFA) supplementation on performance and egg characteristics of old breeder hens. S. Afr. J. Anim. Sci. 37:158–163.

Soltan, M.A., 2008. Effect of organic acid supplementation on egg

production, egg quality, and some blood serum parameters in laying hens. Int. J. Poult. Sci. 7:613–621.

Sultan, S.S.; and Shehate, M., 2012. Antidiabetic and hypochlesrolemic: effect of different types of vinegar in rat. Lif Sci. J. 9: 2141-51.

Sorrells, K.M.; and Speck, M.L., 1970 . Inhibition of Salmonella gallinarum by culture filtrates of Leconostoc citrovorum. J. Dairy. Sci. 239-241

Sturkie, P.D., 1986. Avian physiology . 4th Edn. Springer-Verlag, inc., New Work, NY.

Swiatkiewicz, S., Koreleski, J.; and Arczewska, A., 2010. Laying performance and eggshell quality in laying hens fed diets supplemented with prebiotics and organic acids. Czech. J. Anim. Sci. 55:294–306.

Yamauchi, K.; Ruttanavut, J.; and Takenoyama, S., 2010. Effects of dietary bamboo charcoal powder including vinegar liquid on chicken performance and histological alterations of intestine. J. Anim. Feed. Sci. 19:257–268.

Yesilbag , D.; and colpan, I., 2006 . Effect of organic acid supplemented diet on growth performance, egg production and quality and on serum parameters in laying hens. Revue de Medecine Veterinaire.175:280-284.

الملخص العربي

تأثير أضافة مخلوط فحم الخشب والخل علي الاداء الانتاجي و التناسلي ، و العد البكتيري في امعاء الدجاج البياض كبير العمر

اماني عادل الصحن ، وسام اديب فارس ، منى رفعت محمد أحمد ، مروه رمضان الدقن

معهد بحوث الإنتاج الحيواني- مركز البحوث الزراعية. وزارة الزراعة. مصر

أجريت هذه الدراسة لمعرفة مدي تاثير أضافة خليط من فحم الخشب والخل علي الاداء الانتاجي والتناسلي والعد البكتيري في امعاء الدجاج البياض كبير العمر. أستخدم في هذه الدراسه عدد ١٤٤ طائر (١٢٠ دجاجه و٢٤ ديك) عمر ٥٢ اسبوع من سلالة الجميزه.تم وزن الطيور فرديا وقسمت عشوائيا الي اربع مجموعات كل مجموعة تتكون من ثلاث مكررات (١٢ عشه) في عنبر يعمل بالنظام المفتوح (١٠ دجاجه و٢ ديك لكل مكرره) حتي نهاية التجربه عند عمر ٦٤ اسبوع . استخدمت المجموعة الاولي كمجموعة مقارنه (كنترول) وتم تغذيتها علي العليقة الاساسية . اما الثلاث مجاميع الاخري فقد غذيت علي العليقة الاساسية مضاف اليها خليط من فحم الخشب و الخل ٠,٥ , ١,٠ , ١,٥ % للمعاملات الثانية (CV1) والثالثة (CV2) والرابعة (CV3) علي التوالي وكانت اهم النتائج المتحصل عليها كما يلي : ادي تغذية الدجاج علي المعاملات الثانية والثالثة و الرابعة الي تحسن في كلا من وزن البيضة وكتلة البيض ونسبة انتاج البيض لكل المجاميع المضاف اليها مخلوط الفحم والخل مقارنة بمجموعة الكنترول. حدثت زيادة معنويه في سمك القشرة حيث زاد سمك القشرة للبيض الناتج من دجاجات المجموعة الرابعة مقارنة بباقي المجاميع المدروسة. اظهرت النتائج انخفاض معنوي للعد البكتيري للثلاث مجموعات الثانيه والثالثة والرابعة مقارنه بمجموعة الكنترول. سجل البيض الناتج من المجموعتين الثالثة والرابعة زياده معنويه في نسبة الفقس مقارنة بالمجموعة الثانية والكنترول. سجلت طيور المجموعة الرابعة اعلي قيم لكلا من الكالسيوم والفسفور والجلوكوز مقارنة بالمجموعات الاخري. وعلي ذلك اوضحت نتائج الدراسه انه من الممكن إضافة خليط من فحم الخشب والخل لعلف الدجاج البياض الكبير في العمر بنسبة تصل الي ١,٥ % للحصول علي زيادة في انتاج البيض ونسب الفقس و تحسن سمك قشرة البيض وانخفاض العدد البكتير