Egypt. J. Vet. Sci. **Vol. 54,** No. 4, pp. 579-588 (2023)

Egyptian Journal of Veterinary Sciences
https://ejvs.journals.ekb.eg/

Impact of Untreated Olive Pulp on Hematological and Growth Performance in Broiler Treated with NDvaccine

Dildar S. Ahmad* and Alaa H. A. Al-Hamdani
Pathology and Poultry Diseases Department, Faculty of Veterinary Medicine, University of Mosul, Iraq.

AN objective study is on the olive oil by-product industry that may be used without a feedlot as compromising the taste, dietary, digestibility value, health, and growth performance of broilers. This investigation was conducted in order to determine the results of using untreated olive pulp on the hematological parameters and performance of broiler chickens. 180 one-day-old Ross chick's broilers came from a nearby commercial hatchery. The chicks were divided randomly into 4 groups, each group including (45) birds in floor cages when the experiment was running, which was 42 days, of Veterinary medicine of Mosul University provided environmental conditions controlled during the experiment's length, which was 42 days of age. OP was purchased from a nearby factory that makes olive oil. and was included in quantities of the basic starter and growth diets of 5% which equal 50g/kg diet. control group (G1) fed on just a marketed diet (no olive pulp was added), G2 fed on a commercial diet and vaccinated with ND vaccine, G3 fed on a marketed diet with OP 5%, G4 fed on a commercial diet with OP 5% and vaccinated with ND vaccine. The parameters have been taken at 14,28and 42day of age. The results showed a negative effect on the body weight B.W, food conversion ratio FCR, and an appositive effect on the heterophil and lymphocytes number and hematocrit (Hb), packed cell volume (PCV), and stress index.

Keywords: Olive pulp, Body weight, Blood parameters, Broiler chickens.

Introduction

The poultry industry is increasing while competing with people for food; as a result, it is advised to use some waste olive pieces that are not consumed by humans as an alternate poultry feed additives' source [1]. The dried-up remnant "Olive cake", which is the base material left over after the process of making olive oil, is known as olive pulp (OP). It is an excellent source of a number of physiologically active chemicals and possesses antibacterial, antifungal, and antioxidant effects [2].

OP is regarded as an excellent source of calcium, copper, cobalt, and fat, but, due to its high lignin content, digestible protein, low energy level, and mineral content as well as its deficiency in sodium, magnesium, and phosphorus, but with acceptable amounts of manganese and zinc., it has poor nutritional value [3]. OP additionally includes a number of active substances with Antibacterial, antifungal, and antioxidant properties [4-6]. By Saleh and Alzawqari [7], poultry fed 10% and 5% recycled olive waste demonstrated improved body weight and feed conversion ratio.

Hematological Studies on ecology and physiology are important for understanding how blood properties relate to the surroundings [8], and therefore might be helpful in choosing the creatures that have particular hereditary disorders and environmental circumstances resistant to them [10, 9]. Another useful physiological state markers for animals are hematological measures [11], they have reportedly offered useful insight on the health of an animal's immune system

Corresponding author: Dildar Sabri Ahmad, E- mail: dldarkurdi79@gmail.com, Tel.: 07504544918
(Received 03/03/2023, accepted 05/04/2023)
DOI: 10.21608/EJVS.2023.197750.1454

[12]. Blood profiles can be used as a diagnostic technique to evaluate a flock's health [13]. Several factors include pathogenic or nutritional [14], physiological [15], environmental condition [14,16], dietary contents [17,18], age [19], medication administration [20], anti-aflatoxin therapy [21], fasting [22], and age and ongoing dietary augmentation of vitamins [13]. affect the blood profile of healthy birds. So this study concluded to research the impact of olive pulp about the broilers' body weight, food conversion, and blood parameters.

Material and Procedures

The Chicks

(180) -Ross, One -day chick was bought from a nearby business hatchery. Chicks were kept in four cages (1.5 × 1.5m) In the case of taking growth performance, there must be replicates for each treatment cage of 45 chickens. The floor space offered for 0.15 m^2 per bird. Cages may be seen in a barn housing chickens. of Veterinary medicine at Mosul University and provided with environmental circumstances controlled (Light and airflow). The ratios were applied according to the Ross Manual's suggestions [23].

Olive pulp

(OP) gotten from a local olive oil preparation factory According to the criteria for determining chemical composition, [24]. Dried OP was added to the standard starter and finisher ratio at concentrations of 5%.

Experimental design:

The experiments were dispersed using an entirely random process.

Group 1: G1(control group) fed on just a standard ration (no olive pulp was added)

Group 2: G2 was vaccinated against ND and given a standard ration.

Group 3: G3 given a standard ratio with 5% OP

Group 4: given a standardized diet of OP 5% and vaccinated with ND vaccine

Vaccination has been done by Newcastle vaccine (Clon 30) two times at (10) days old and (21) days old by drinking water method. This vaccine was produced by Intervet International B.V. (Boxmeer-Holland).

The birds were weighed at 14,28 and 42 days of age, the amount of feed consumed also has been calculated at the same periods.

Blood samples were taken for three-time at 14,28 and 42 days old from the heart using a sterile syringe and each sample was divided into two parts.

The first one included ethylene diamine tetra acetic acid (10 mg), an anticoagulant (EDTA). done in accordance with established norms [25], to calculate blood hemoglobin (HB) and packed cell volume (PCV) .The second was kept without anticoagulant to study Differential leukocyte count (DLC) in accordance with accepted norms [25] and stress index [26].

Growth performance

1- The chicks' body weight was measured using an electronic balance described (DT580 Digital., China) to obtain the weight gain at 14,28, and 42 days old.

2- Food conversion ratio (FCR) was determined using the equation:

FCR = food consumption (FC) / body weight gain (BWG) [27].

Hematological parameters

Experiments were dispersed using an entirely random design and included three slaughter stages, the first slaughter at (14) days old, the second slaughter at (28 days old), and the third slaughter at (42 days old, for blood collecting and hematological parameters analysis.

Blood was taken directly from the heart of one randomly chosen chick after each reproduction. The whole blood sample was injected into a tube that has been pretreated with 10 mg of the anticoagulant ethylene diamine tetra acetic acid after being removed from the syringe (EDTA). done in accordance with established norms [27]. To determine the hematological parameters: differential leukocyte count (DLC) and packed cell volume (PCV), blood hemoglobin (Hb) concentration, and stress index.

Statistical analysis

A randomized complete design (C.R.D.) was used in a 3 x 4 factorial experiment (slaughter age x sputtering treatments) with comparison treatment to analyze the data of the experiment, and to find out the significant differences between the means of the two factors and their interactions, the Duncan multiple range test was used at the 0.05 level of probability [30].

Results

Body performance

Table (1) displays the impact of olive pulp on the treated chicks' body weight. The G1 and G2 did not significantly differ from one another at (14 days of age but these two groups are significantly increased from the G3 and G4 which are not significantly different. At the (28) day of age, There was no obvious difference between all the four groups. but at (42) days of age, G4 decreased significantly from G1. G2 and G3.

But Table 2 cleared that the food conversion ratio FCR at the age of (14) days in the groups (G1, G2, G3) had no significant difference with each other at the day (28). The G3 and G4 did not significantly differ from one another, which they are increased significantly from the G1and G2 but at the (42) day old the G4 is significantly increased from the other three groups which are at ($P \leq 0.05$) not substantially different. The result of the effect of OP on food conception was shown in table (3) which showed that The G1, G2, and G3 did not significantly differ from one another at day (14) of age, and G3 and G4 were similar significantly but G1and G2 was different significantly from G4 at ($P \leq 0.05$), at age (28) days both control (G1) and (G2) differed considerably from (G3) and (G4). At (28 and 42) days of age, control and G2 were substantially different from G3 and G4.

Blood parameters

Table (4) shows at the age of (14) days, the G2, the heterophil number increased significantly above the G4 at ($P \leq 0.05$), While G1, G2, and G3 do not significantly differ from one another, at the same time There was no discernible difference between G1, G3, and G4 at either the age of 28 or 42.) days and no significant difference between each group were seen.

Table (5) showed there is no significant difference between the four groups on day 14, but on the 28 there is a substantial variation over the course of 42 days between the control group and the other three groups there is an increase in the lymphocytes but not significant in the three groups compared with the control.

TABLE 1. Impact of untreated olive pulp on body weight (g)in broiler treated with ND vaccine.

Age/ Treatments	Day 14	Day 28	Day 42
Control (G1)	530.00±32.32^{a}	1553.50±83.89^{a}	2705.00±193.38^{a}
Food + ND (G2)	507.50±17.97^{a}	1503.00±9.53^{a}	2638.75±60.41^{ab}
Food + Op (G3)	464.25±17.97^{b}	1474.75±72.08^{a}	2493.50±124.30^{b}
Food + OP + ND(G4)	490.00±2.77^{ab}	1417.25±6.78^{a}	2228.25±1.31^{c}

The vertically different letters on the treatments mean to list notable differences between them at ($P \leq 0.05$), and vice versa, based on Duncan's multiple-range test.

TABLE 2. Impact of untreated olive pulp on FCR (g FC / g WG) in broiler treated with ND vaccine.

Age/ Treatments	Day 14	Day 28	Day 42
Control (G1)	0.82±0.05^{a}	1.59±0.39^{a}	1.69±0.10^{a}
Food+ND (G2)	0.85±0.11^{a}	1.53±0.16^{a}	1.64±0.05^{a}
Food+OP (G3	0.82±0.07^{a}	1.66±0.31^{b}	1.68±0.09^{a}
Food+ OP+ ND (G4)	0.89±0.08^{b}	2.01±0.19^{b}	1.87±0.02^{b}

The vertically different letters on the treatments mean to list notable differences between the at ($P \leq 0.05$), and vice versa based on Duncan's multiple-range test..

TABLE 3. Impact of untreated olive pulp on food consumption g/bird/2 weeks in broiler treated with ND vaccine.

Age/ Treatments	Day 14	Day 28	Day 42	Total FC
Control (G1)	835.25±10.31^{a}	1746.75±2.63^{a}	1704.25±2.75^{a}	4286.25±9.74^{a}
Food+ ND (G2)	835.25±5.62^{a}	1725.50±23.10^{a}	1703.50±2.65^{a}	4264.25±23.6^{a}
Food+ OP (OP)	823.50±8.66^{ab}	1642.75±18.93^{b}	1633.25±20.25^{b}	4099.5±20.66^{b}
Food +Olive+ND	813.75±18^{b}	1620.00±1.83^{b}	1635.25±9.74^{b}	4069±9.16^{b}

The vertically different letters on the treatments mean to list notable differences between the at ($P \leq 0.05$), and vice versa based on Duncan's multiple-range test.

TABLE 4. Impact of untreated olive pulp on numbers of heterophil and interaction between age with treatments in broiler treated with ND vaccine .

Age/ Treatments	Day 14	Day 28	Day 42	Treatments average
Control (G1)	9.67±1.53^{abc}	6.40±0.55^{c}	9.60±2.07^{abc}	8.38±2.14^{a}
Feed+ND (G2)	10.67±2.08^{a}	6.83±1.6^{bc}	6.40±1.95^{c}	7.50±2.41^{a}
Feed+OP(G3)	10.17±3.25^{ab}	6.75±2.5^{bc}	8.25±0.96^{abc}	8.64±2.82^{a}
Feed+OP+ND(G4)	6.67±2.73^{bc}	7.17±3.19^{bc}	8.6±1.82^{abc}	7.41±2.65^{a}
Age average	9.00±3.01^{a}	6.81±2.06^{b}	8.21±2.04^{ab}	

The different letters on the treatments mean to list notable differences between them at ($P \leq 0.05$), and vice versa, based on Duncan's multiple-range test.

TABLE 5. Impact of untreated olive pulp on lymphocytes and interaction between age with treatments in broiler treated with ND vaccine.

Age/ Treatments	Day 14	Day 28	Day 42	Treatments average
Control (G1)	84.00±1.73^{bc}	89.40±2.07^{a}	81.20±2.39^{bc}	85.00±4.26^{a}
Feed+ND (G2)	83.33±2.08^{bc}	86.00±3.63^{abc}	85.80±4.32^{abc}	85.36±3.56^{a}
Feed+OP (G3)	84.33±3.2^{abc}	85.25±3.5^{abc}	85.25±1.89^{abc}	84.86±2.80^{a}
Feed+Pulp+ND(G4)	87.67±4.46^{ab}	87.50±4.42^{ab}	83.00±2.83^{bc}	86.24±4.35^{a}
Age average	85.22±3.61^{ab}	87.10±3.65^{a}	83.74±3.38^{b}	

The different letters on the treatments mean to list notable differences between them at ($P \leq 0.05$), and vice versa, based on Duncan's multiple-range test.

Table (6)'s findings indicate that there are no statistically significant differences between each group on the packed cell volume (PCV) concentration that is not affected by op providing at day 14. But there is a significant difference increase of both G3 and G4 in both ages (28 and 42) days in comparison with both and G2 which does not substantially different at ($P \leq 0.05$), Also there is no distinction between G3 and G4 at age (42) days.

The effect of OP supplementation on Hb concertation Table (7) demonstrates that there was no discernible difference between the four groups at (14) days of age but at the age, (28) and (42) days old both G 3 and G 4 increased significantly compared with the and G2 at ($P \leq 0.05$), while both G1 and G2 are not statistically distinct at either age (28 or 42).

Table (8) explained that there was little distinction between the control group G1, G2, and G3 at (14) days old G3 but at the same old G2 differed significantly from G4 at ($P \leq 0.05$) that mean OP had a positive effect on vaccination stress. But at both ages (28 and 42) days There were no discernible differences between all four groups. cleared that the G4 at both old (14-28) days was affected positively by olive pulp supplementation and decreased stress index produced by Newcastle ND vaccination in comparison with G2 in both (14-28) days old.

Table (9) shows the positive effect of olive pulp on the ND vaccine, at different ages. On day (14) G4 was different significantly from the other three groups at ($P \leq 0.05$), while in the day (28) both G2 and G4 were different significantly to other both G1 and G3 at ($P \leq 0.05$), so in the day (42) G4 was different significantly from other groups at ($P \leq 0.05$),

Discussion

The values obtained were in consonance with the findings of Zangeneh and Torki [28]. who

TABLE 6. Impact of untreated olive pulp on PCV and interaction between age with treatments in broiler treated with ND vaccine.

Age/ Treatments	Day 14	Day 28	Day 42	Treatments average
Control (G1)	27.87±3.78^{a-c}	25.27±2.86^{c}	25.53±4.53^{c}	26.22±3.88^{b}
Feed+ND (G2)	30.07±3.69^{a}	25.33±2.72^{c}	25.33±2.92^{c}	28.91±3.81^{b}
Feed+OP (G3)	30.47±3.74^{a}	28.27±3.71^{ab}	28.33±3.84^{ab}	29.07±3.84^{a}
Feed+OP+ND(G4)	29.2±2.51^{a}	28.6±4.08^{a}	28.6±4.08^{a}	28.8±3.56^{a}
Age average	29.4±3.53^{a}	26.87±3.68^{b}	26.95±4.09^{b}	

The various letters on the treatment mean to list notable differences between them at ($P \leq 0.05$), and vice versa, based on Duncan's multiple-range test..

TABLE 7. Impact of untreated olive pulp on Hb concentration and interaction between age with treatments in broiler treated with ND vaccine.

Age/Treatments	Day 14	Day 28	Day 42	Treatments average
Control	9.29±1.26^{abc}	9.44±0.96^{c}	8.51±1.51^{bc}	8.74±1.29^{b}
Feed+ND	10.02±1.23^{a}	8.44±0.91^{c}	8.44±0.97^{c}	8.97±1.26^{b}
Feed+pulp	10.17±1.25^{a}	9.42±1.26^{ab}	9.44±1.28^{ab}	9.67±1.28^{a}
Feed+pulp+ND	9.73±0.84^{a}	9.53±1.36^{a}	9.53±1.36^{a}	9.6±1.18^{a}
Age average	9.80±1.18^{a}	8.97±1.23^{b}	8.98±1.36^{b}	

The different letters on the treatment mean to list notable differences between them at ($P \leq 0.05$), and vice versa, according to Duncan's multiple range test.

TABLE 8. Impact of untreated olive pulp on stress index and interaction between ages with treatments in broiler treated with ND vaccine.

Age/Treatments	Day 14	Day 28	Day 42	Treatments (average)
Control (G1)	0.113±0.02^{a-c}	0.074±0.01^{c}	0.12±0.03^{a-c}	0.1007±0.02^{a}
Feed+ND (G2)	0.13±0.02^{a}	0.078±0.02^{bc}	0.074±0.02^{c}	0.087±0.03^{a}
Feed+OP (G3)	0.123±0.03^{ab}	0.08±0.03^{bc}	0.1±0.01^{a-c}	0.104±0.03^{a}
Feed+OP+ND(G4)	0.078±0.03^{bc}	0.081±0.04^{bc}	0.0104±0.03^{a-c}	0.087±0.04^{a}
Age (average)	0.107±0.04^{a}	0.078±0.02^{b}	0.099±0.03a	

The different letters on the treatment mean to list notable differences between them at ($P \leq 0.05$), and vice versa, according to Duncan's multiple range test.

TABLE 9. Shows the effect of olive pulp on NDvaccine

Age/treatment	14 day	28 day	42 day
Control	0.13±0.38^{c}	0.21±0.37^{b}	0.26±0.52^{c}
Feed+ND	0.63±1.45^{b}	0.6±1.74^{a}	0.64±1.72^{b}
Feed+Olive	0.1±0.39^{c}	0.11±0.39^{b}	0.29±0.56^{c}
Feed+Olive+ND	0.58±1.88^{a}	0.4±2^{a}	0.71±2.26^{a}

The vertically different letters on the treatments mean to list notable differences between the at ($P \leq 0.05$), and vice versa based on Duncan's multiple-range test.

showed the highest antibody response to Newcastle disease virus in hens fed on OP (45 g/kg) diet. so there have been several attempts to locate some available and less expensive sources to substitute a portion of the chicken diets' nutritious and costly diet that boosts output [29]. Olive pulp has been used in this study in a 5% ratio in the feed of broilers, the results show that there was no benefit from OP supplementation based on weight gain this result was arranged with the result of Pappas et al.[30], also arranged with Rosario & Domingues [31]. They claimed that the production of poultry and the consumption of feed are negatively impacted by the presence of xyloglucan (non-starch polysaccharides, NSP), which is found on the cell walls of olive pulp is the cause of lower reduced broiler chicken performance and feed consumption. But the results were not arranged with the results of [32], they found an increase in body weight when they use the olive pulp as a feed additive and this difference was due to they used the OP treated with gamma irradiation because the radiation has been found to improve the digestibility of protein, fat, and fiber reducing the deleterious effects of NPS [33]. Also, the results showed that the FCR was increased in the groups that were supplemented with OP and this increase is compatible with the reduction of the weight and arranged with the result of Ibrahim et al. [29]**.**

The results of hematological traits represent an index of response to a stressor and strong indicators of assessing the clinical and nutritional health status of chicks in feeding trials [34]. The inclusion of olive by-products to the laying quail diets had positive effects on the hematological profile, which confirmed the highest health of treated groups during the whole experimental period. The findings of this investigation indicated a beneficial impact of OP supplement on the

heterophil and lymphocyte number and this result arranged with the result [35], but their study was on rabbits but the study results were not arranged with El-Sayaad et al. [33].in their study on Japan's quails and Ibrahim et al.[29]. in their study on broilers but they have used the OP treated with gamma irradiation.

The concentration of Hb and the PCV in the treated groups in this study have been positively affected and the results arranged with Hamed et al.[32]. and this could be due to the OP containing various active compounds in its structure and one of them is antioxidant [4,5,6]**.**

The previous results cleared that dietary OP supplementation had no extraordinary influence on erythropoiesis, leukopoiesis, hemoglobin synthesis, and hematocrit levels as agreed with that mentioned by Zangeneh and Torki [28].who reported that there was no significant effect of dietary OP with levels 0, 4.5 and 9% on leucocytes differential counts of laying hens.

Conclusion

The results of this study concluded that adding the untreated olive pulp to broiler meals at a level of 5% can help maintain excellent health and decrease stress factors without influencing the feed-to-gain ratio negatively and WBC count positively affecting PCV% and Hb concentration. Unfortunately decreasing food conversation ratio (FCR). Further research may improve olive pulp's application in broiler diets by maximizing its anti-stress and antioxidant properties. while op has a positive impact on the ND vaccine in broilers.

Acknowledgment

Our thanks to the University of Mosul, the College of Veterinary Medicine, and the College of veterinary for the facilities provided to complete this study.

Conflict of Interest

There is no conflict of interest.

Funding statement

Self-funded.

Ethical approval

The study was approved by the Research Ethical Committee and Scientific Committee in the Department of Veterinary Basic Science of the College of veterinary medicine/ University of Mosul.

References

1. Mikail Yeniçeri, Ayşe Gül Filik and Gökhan Filik. The effect of olive wasted for poultry feed on growth performance of broilers: A review. *J. Glob. Innov. Agric. Sci., ,* **9**(4), 163-166(2021).
2. Al-harthi, M.A. The chemical composition and nutrient profiles and energy values of olive cake for poultry diets. *Life Science Journal*, **11**(9),159-165(2014).
3. Afsari, M., A. Mohebbifar, and M. Torki. Effects of Dietary Inclusion of Olive Pulp Supplemented with Probiotics on Productive Performance, Egg Quality and Blood Parameters of Laying Hens. *Annual Research & Review in Biology,* **4** (1), 198–211 (2014). doi:10.9734/ARRB/2014/5212.
4. Santini, A., Tenore, G. C. and Novellino, E. Nutraceuticals: A paradigm of proactive medicine. *Eur. J. Pharm. Sci.,* **96**,53-61(2017).
5. Huang, X. Y., Zhang, X., Pei, D., Liu, J. F., Gong, Y., Aisa, H. A. and Di, D. L. Continuous separation of maslinic and oleanolic acids from the olive pulp by high–speed countercurrent chromatography with elution–extrusion mode. *J. Sep. Sci.,* 42:2080-208 (2019).
6. Alves, E., Melo, T., Barros, M. P., Domingues, M. R. M and Domingues, M. R. M. P. Lipidomic profiling of the olive (OleaeuropaeaL.) fruit towards its valorization as functional food: In–depth identification of triacylglycerols and polar lipids in Portuguese olives. *Molecules*., **24**, 2555(2019).
7. Saleh, A. and Alzawqari, M. Effects of Replacing Yellow Corn with Olive Cake Meal on Growth Performance, Plasma Lipid Profile, and Muscle Fatty Acid Content in Broilers. *Animals,* **8**:2240(2021).
8. Ovuru, S. S. and Ekweozor, I. K. E. Hematological changes associated with crude oil ingestion in experimental rabbits. *African Journal of Biotechnology*, **3**(6), 346-348 (2004).
9. Mmereole, F. U. C. The Effects of Replacing Groundnut Cake with Rubber Seed Meal on the Haematological and Serological Indices of Broilers. *International Journal of Poultry Science,* **7**(6), 622-624(2008).

10. Isaac, L. J., Abah, G., Akpan, B. and Ekaette, I. U. Hematological properties of different breeds and sexes of rabbits (p.24-27). Proceedings of the 18th Annual Conference of Animal Science Association of Nigeria(2013)..

11. Khan, T. A. and Zafar, F. Haematological Study in Response to Varying Doses of Estrogen in Broiler Chicken. *International Journal of Poultry Science,* **4**(10), 748-751 (2005).

12. Kral, I. and Suchy, P. Haematological studies in adolescent breeding cocks. *Acta. Vet. Bras.,* **69**, 189-194(2000).

13. Tras, B., Inal, F., Bas, A.L., Altunok, V., Elmas, M. and Yazar, E. Effects of continuous supplementation of ascorbic acid, aspirin, vitamin E and selenium on some hematological parameters and serum superoxide dismutase level in broiler chickens. *Br. Poult. Sci.,* **41**, 664-666(2000).

14. Garacyk, S., Pliszczackrol, A., Kotonski, B., Wilczek, J. and Chmrelak, Z. Examination of hematological and metabolic changes mechanism of acute stress in turkeys. *Electronic J. Polish Agric. Un. Vet. Med.,* **6**, 1-10(2003).

15. Alodan, A.M. and Mashaly, M.M. Effect of induced molting in laying hens on production and immune parameters. *Poultry. Sci.,* **78**, 171-177(1999).

16. Vecerek, V., Strakova, E., Suchy, P. and Volslacrova, E. Influence of high environmental temperature on production and hematological and biochemical indexes in broiler chickens. *Czech. J. Anim. Sci.,* **47**(5), 176-182. (2002).

17. Iheukwumere, F.C. and Herbert, U. Physiological responses of broiler chickens to quantitative water restrictions: Haematology and serum biochemistry. *Inter. J. Poult. Sci.,* **2***,* 117-119(2002).

18. Kurtoglu, F., Kurtoglu, V., Celik, I., Kececi, T. and Nizamlioglu, M. Effect of dietary boron supplementation on some biochemical parameters, peripheral blood lymphocytes, splenic plasma cells, and bone characteristics of broiler chicks given diets with adequate or inadequate cholecalciferol (Vitamin D3) content. *Br. Poult. Sci.* **46**, 87-96(2005).

19. Seiser, P.E., Duffy, L.K., Mcguire, A.D., Roby, D., Golet, G.H. and Litzow, M.A. Comparison of pigeon guillemot: Blood parameters from oiled and unoiled areas of Alaska eight years after the Exxon Valdez oil spill. Mar. *Bull.,* **40**, 152-164(2000).

20. Oguz, H.T., Kececi, Y.O., Birdane, F. and Kurtoglu, V. Effect of clinoptilolite on blood biochemical and hematological aflatoxicosis. *Res. Vet. Sci.,* **69,** 89-93(2002).

21. Lamosova, D., Malabova, M. and Zeman, M. Effects of short-term fasting on selected physiological functions in adult male and female Japanese quail. *Acta. Vet. Brno.,* **73**, 9-16(2004).

22. Aviagen. Ross broiler management manual; 2009.

23. AOAC, *Official Methods of Analysis of AOAC International*, 18th ed., Gaithersburg, MD: Rev. 2. AOAC Int., (2007).

24. Weiss, D.J. and Wardrop, K.J. Schalm's veterinary hematology. 6th ed. Ames: Wiley-Blackwell; (2010).

25. Balcombe, J. P., Barnard, N. D. and Sandusky, C. Laboratory routines cause animal stress. *Contemp. Top. Lab. Anim. Sci.,* **26**(43),42-51(2004).

26. Ibrahim Ismail Khalil. Poultry feeding. First Edition - University of Mosul – Iraq. (1987)

27. Alrawi khashaa Mahmoud and Abd Aziz Muhammad Khalaf Allah. Design and analysis of agricultural experiments. Mosul, Iraq, Dar Al-Kutub Foundation for Printing and Publishing - University of Mosul(2000).

28. Zangeneh, S. and M. Torki. Effects of B-mannanase supplementing of olive plubincluded diet on performance of laying hens, egg quality characteristics, humoral and cellular immune response and blood parameters. *Global Veterinaria*, **7**,391-398 (2011)

29. Ibrahim, N.S., Sabic, E.M. and Abu-Taleb, A.M. Effect of inclusion irradiated olive pulp in laying quail diets on biological Performance. *Journal of Radiation Research and Applied Science*, **11**(4),340-346(2018).

30. Pappas, A. C., Tsiplakou, E., Papadomichelakis, G., Mitsiopoulou, C., Sotirakoglou, K., Mpekelis, V., Haroutounian, S. A., Fegeros, K. and Zervas, G. Effects of Olive Pulp Addition to Broiler Diets on Performance, Selected Biochemical Parameters and Antioxidant Enzymes. *Journal of the Hellenic Veterinary Medical Society*, **70** (3), 1687–1696(2019). doi:10.12681/jhvms.21793.

31. Rosario, M. and Domingues, M. Structural characterization of underivatized olive pulp xylooligosaccharides by mass spectrometry using matrix-assisted laser desorption/ionization and electrospray ionization. *Rapid Communications in Mass Spectrometry,* **16,** 2124–2132(2002).

32. Hamed, A. El-Hady, G. A. A. Hamady, and Abu-Taleb, A. M. Biological Application Department, Nuclear Research Center, Atomic Energy Authority, Abou-Zabael P.O. 13759, Egypt.

33. El-Sayaad, G.A.E., Farag, M.D.E.D., Amany, A., Khayyal, A., Abdella, M.M. and Mekawy, H.M.S. Effect of feeding diets containing irradiated olive cake on growth performance of growing rabbits. *Egyptian J. Nutr. And Feed*, **12**(3), 461-474(2009).

34. Doyle, D. William Hewson (1739-74). The father of hematology. *British Journal of Haematology,* **133**(4), 375–381(2006).

35. Rupiæ, V., Huskiæ, Lina, Craneiæ, N., Boac, R., Stipiæ, N. and VeNik, F. Olive cake in fattening chickens (in Croatian). *Krmiva*, **34**, 175184(1993).

تأثير تفل الزيتون غير المعالج على أداء الدم والنمو في دجاج التسمين المعالج بـلقاح نيوكاسل ND

دلدار صبري احمد و آلاء حسين علي
قسم الامراض وامراض الدواجن ـ كلية الطب البيطري- جامعة الموصل ـ الموصل ـ العراق.

تفل الزيتون (OP) هو منتج ثانوي لزيت الزيتون يمكن استخدامه بدون حقل تسمين لأنه يضر بالمذاق ، والنظام الغذائي ، وقيمة الهضم ، والصحة ، وأداء دجاج التسمين. أجريت هذه الدراسة لمعرفة تأثير استخدام الدجاج اللاحم غير المعالج على الخصائص الدموية وأداء دجاج التسمين. ١٨٠ فرخًا من كتكوت روس يبلغ من العمر يومًا واحدًا يفقس من مفرخ تجاري قريب. قسمت الكتاكيت عشوائياً إلى ٤ مجموعات ، تم تربية الطيور في أقفاص أرضية حتى نهاية التجربة بعمر ٤٢ يوم تحت ظروف بيئية مضبوطة كالسلالة المطلوبة في الطب البيطري بجامعة الموصل. تم شراء OP من مصنع قريب ينتج زيت الزيتون وتم تضمينه بمعدل ٥٪ وزن بالوزن مع كل من نسب البداية والنمو. المجموعة الضابطة (G1) تتغذى على نظام غذائي مسوق فقط (لم يتم إضافة لب الزيتون) ، وتغذية G2 على نظام غذائي تجاري وتطعيمها بلقاح مرض نيوكاسل (ND) ، G3 تتغذى على نظام غذائي مسوق مع 5 OP٪ ، G4 تغذى على نظام غذائي تجاري مع 5 OP٪ ولقاح ND. تم أخذ المعلمات في عمر ١٤ و ٢٨ و ٤٢ يومًا.