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Effect of using Different Levels of Evening Primrose Oil EPO and Grape Seed Oil (GSO) in Broiler Diets on Production Performance, and Oxidation Status and Composition of Fatty Acids in Meat

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Abstract: ***This study has been carried in the poultry research station of the agricultural researches department / Ministry of Agriculture from 02/02/2017 to 23/02/2017 to study the effect of adding different levels of evening primrose oil (EPO) and grape seed oil (GSO) in production performance , fat profile and oxidation status in broilers meat. In this experiment 500 (Rosss308) broilers at the age of 21 days has been used, these birds has randomly distributed on 5 dietary treatments (Control diet) without adding, 0.5% of EPO was used in E1, 1 % EPO was used in E2, 0.5% of GSO was used in G1, 1% of GSO was used in G2, each treatment has five replicated (25 birds/replicates). The birds have been fed with one diet along the time of the experiment and the diets were calculated as recorded on (NRC, 1994). The results has recorded a significant increase (P<0.05) in the average of body weight for the G2 treatment birds which 1% of GSO was used in this treatment at the weeks 4, 5 and 6 and doesn't differ significantly from the E1 treatment which used 0.5% of EPO. Using 0.5% and 1% of GSO and EPO has improved the feed conversion ratio for birds along the experiment time and significantly exceeded (p<0.05) the relative weight for the chest piece in the G2 treatment and also the percentage of the liver weight in E1 and E2 treatments.The results showed a significant decrease in the value of Malondialdehydein the meat of the birds of G2 treatment and didn't differ significantly from the rest of the treatments of the experiment which EPO and GSO oil added to this treatment. There was a significant increase in the level of Prostaglandin PGE2 in the blood plasma of the birds of the treatments E2 and G2 and this treatment didn't significantly differ from the treatment E1, using EPO oil and GSO resulted in increasing the level of unsaturated fatty acids (alpha-linoleic, linoleic, oleic), in the meat of the birds of G1 and G2 treatments and then the treatments E1 and E2 Compared with control treatment.***

Keyword: Evening Primrose Oil (EPO) ,Grape Seed Oil (GSO), Broiler, Production Performance , Antioxidant Status, Fatty Acid Composition

1. Introduction

Fat is one of the basic nutrients in human and animal nutrition, and it's the power source in the body because it contain twice as much energy as the rest of the nutrients in the diet, the attention was focused in the recent years on the effect of fats and oils on the nutritional system and body health, the effect of fats and oils primarily depends on its fatty acids content and the level of these acids, and the World Health Organization (WHO , 2005) has confirmed that there is an assured connection between the nutritional system and lifestyle diseases, and has recommended that the proportion of handled fatty acids of omega-3 type is (5-8%) and fatty acids of omega-6 type is (1-2%), and for increasing the knowledge of the consumers in the direct relationship between the nutrition and health; the attention in the production of functional foods was appeared, fats and oils in poultry diets are the main sources of energy in the diet and it produce twice as much energy as the rest of the nutrients in the diet, and there is another different sources of fats in the diet which it changes the chemical value in poultry products, that is the content of fatty acids in poultry products primarily depends on the formation content of these acids in the diet (Kelenka et al , 2008; Wiswan , et al 1998), and the trend in recent years has increased towards the use of vegetable oils in poultry diets for its high nutrition and healthful value, in addition to the decreasing of its material cost in comparison with the animal fats, one of the most recently used vegetable oils in poultry nutrition is the omega-6;Evening Promise Oil (EPO) is derived from the seed of Oenotherabiennis. It consists of a variety of fatty acids, including gama-linolenic acid (GLA), linoleic acid (LA), oleic acid, palmitic acid and stearic acid (lisiak et al, 2013).Several studies have indicated the vital role and high effectiveness of GLA that located in EPO. These polyunsaturated fatty acids (PUFA) serve as wide variety as the metabolites (such as prostaglandins leukotriene and hydroxyl fatty acids) regulating critical biological functions (murota and storch, 2005). EPO is also used as a cure for heart and arteries diseases, curing cancer, skin diseases and improving body immunity and considered as an effective antioxidants to contain a high proportion of GLA and multiple antioxidants as catechin, a-tocopherol, gallic acid and epicatech (christic, 1999). One of the most recently used vegetable oils in poultry nutrition is grape seed oil(GSO) and it's from omega-3 type. GSO is natural oil obtained from the seed of vitisvinifira (maier, 2009), grape seed oil is rich in unsaturated fatty acid such as oleic, linoleic and linolenic acid. The researchers have showed that grape seed oil is partial rich in polyphenols and have a wide range of biological activities (preuss et al 2001). Grape seed oil has also a high concentration of flavonoids and it considered as a rich sources of a-tocopherol (vitamin E) (mahaswari and rao, 2005). Recent studies have showed that GSO has strong

antioxidant properties (baydar and akkurt, 2001) and plays an important role in lowering bad cholesterol (LDL) in body and increase the good cholesterol (HDL) (nerantzis and taridis, 2006). GSO exerts many health promoting effects (singh et al, 2004). It effects are anticancer, antibacterial, antiviral, anti-fungal activities (bloom, 2009). Best (2006) showed that feeding grape seed oil improved body weight of pigs. tekeli et al 2014 reported that using grape seed oil in broiler diets significantly improved feed conversion ratio. Therefore, the main goal of this study was to investigate the effect of evening primrose oil (EPO) and grape seed oil (GSO) on productive performance of broiler, antioxidant status and are potential to affect fatty acid profile of broiler meat to improve nutritional value and functionality for consumers.

2. Materials and Methods

Birds and dietary treatments

This study was carried out at poultry research station, Office of Agricultural Research, Ministry of Agriculture for the period from 02/02/2017 to 23/02/2017. Five hundred (500) 21-day-old broiler chicks (Ross 308) were randomly distributed to five dietary treatments (Control diet) without adding, E1 (0.5 % EPO), E2 (1 % EPO), G1 (0.5% GSO) and G2 (1% GSO) with five replicated (25 birds/replicates). All experimental diets were isonitrogenous and isocaloric and formulated to meet the National Research Council (1994) requirements in the Table 1. Body weight of chicks and feed intake were weighed at 4, 5 and 6 weeks. and conversion ratio were calculated by randomly selecting ten birds from each treatment group and measured major carcass characteristic the weight of the relative viscera internal (liver , gizzard and heart) and dressing percentage and major cutting (chest, thigh, drumstick, back and wings). And we are using witte (1970) assay to measure (MDA). And we are using (Shemesh et al., 1979) assay to measure (BGE_2).

Gas Chromatographic Analysis of fatty acid profile of meat

Collected meat samples were carried out to the General Company for vegetable oil, Ministry of Industry, Iraq for the fatty acid profile analysis. Fatty acid profile analysis of the collected meat sample carried out with the help of GC device (SHIMADZU Model17- Japan) (A.O.A.C. 2005).

Statistical Analysis

Completely randomized design (CRD) was used to study the effect of different treatment in all traits. Duncan (1955) multiple range test was used to compare the significant differences between means. Data were analyzed using statistical analysis system (SAS, 2004).

Table 1: Percentage composition of the finisher diets (21-42)day

Ingredients	Diet of treatments				
	Control	E1	E2	G1	G2
Yellow Corn	59.13	59.13	59.13	59.13	59.13
Wheat	10	10	10	10	10
Soybean Meal (48% CP) [1]	20.01	20.01	20.01	20.01	20.01
Meat Meal [2]	5	5	5	5	5
Hydrogenated Vegetable Fat	4	3.5	3	3.5	3
EPO[4]	-	0.5	1	-	-
GSO[5]	-	-	-	0.5	1
Dicalcium Phosphate	0.4	0.4	0.4	0.4	0.4
NaCl	0.1	0.1	0.1	0.1	0.1
Limestone	1.1	1.1	1.1	1.1	1.1
Methionine	0.13	0.13	0.13	0.13	0.13
Lysine	0.13	0.13	0.13	0.13	0.13
Calculated Values[3]					
M.E. Kcal/ Kg Diet	3282	3275	3268	3278	3273
Crude Protein %	18.5	18.5	18.5	18.5	18.5
Fat %	7.3	7.3	7.3	7.3	7.3
Crude Fibre %	2.5	2.5	2.5	2.5	2.5
Lysine, %	1.06	1.06	1.06	1.06	1.06
Methionine Plus Cystine %	0.77	0.77	0.77	0.77	0.77
Ca , %	0.73	0.73	0.73	0.73	0.73
Available P, %	0.57	0.57	0.57	0.57	0.57

[1] Soybean cake used an Argentine source of crude protein content by 48% and 2440 Kcal/ Kg M.E.[2] Protein Meal User Product From Netherlands Origin (Brocon) Contain 40% Crude Protein 0.2107 Kcal / Kg Protein M.E., 0.5% Crude Fat 2.20% Crude Fiber 5%, Calcium 4.68% ,Phosphorus 3.85% Lysine 4.12%, Methionine 4.12% ,Methionine Plus Cystine0.42%, Tryptophan 0.38%, Threonine 1.70%. It Contains A Mixture Of Vitamins And Minerals Needed Believes Rare Birds Of These Elements.[3]Based on National Research Council recommendations (1994). [4] EPO = Evening Promise Oil content 7660 kcal/kg M.E. [5] GSO = grape seed oli content 8133 kcal / kg M.E.

Table 2: Percentage Fatty acids composition to EPO*

Fatty acids	%
Palmitic acid C16:0	6
Stearic acid C18:0	1.8
Oleic acid C18:1	6.3
Linoleic acid C18:2	72.9
γ- Linolenic acid C18:3	10.2

*EPOoil User Product From china (QINGAO YUDA)

Table 3: Percentage Fatty acids composition to GSO*

Fatty acids	%
Palmitic acid C16:0	8.5
Palmitoleic acid C16:1	0.3
Stearic acid C18:0	5.4
Oleic acid C18:1	24.3
Linoleic acid C18:2	66.1
α- Linolenic acid C18:3	1
Icosanoic C20:0	0.3
Icosenoic C20:1	0.2
Docosanoic C22:0	0.1

*GSOoil User Product From Italy (Agrioil S.P.A)

3. Results and Discussion

The table.4 is showing the effect of evening primrose oil (EPO) and grape seed oil (GSO) on the average body weight for birds during the final phase of experment from 4-6 weeks, on the fourth week a significant increase ($P<0.05$) has observed in the average body weight for the birds of the treatment G2 compared with the other treatments and hasn't differ significantly ($P<0.05$) from the treatments G1 and E2, and recorded the less average body weight in control treatment, and the significant differences have continued clearly on the fifth week of the experiment and G2 treatment has significantly exceeded ($P<0.05$) compared

with G1 treatment, these treatments didn't differ from the control, E1 and E2 treatments,in the sixth (final week) of this study the significant weight gain (P<0.05) of the G2 treatment has continued compared to other treatments that did not differ in body weight at the six week age, it was noted from Table (4) that there was no significant difference in the body weight gain of the birds of all treatments at the age of 4 and 5 weeks, but there were significant differences between the treatments during the sixth week of the age of the birds as it has significantly increased (P<0.05), and the average weight gain in treatment G2 was obvious compared with the control treatments E1 and G1, but it hasn't significantly differ from the treatment E2 and this treatment hasn't significantly differ from the other treatments.

Table 4: Effect of Evening Primrose Oil (EPO) And Grape Seed Oil (GSO) On Body Weight And Body Weight Gain oOf Broiler

Age week	Treatment*				
	Control	**E1**	**E2**	**G1**	**G2**
Body Weight (g.)					
4	1168.62±16.20^{c}	1252.43±24.17^{ab}	1218.72±26.08^{b}	1198.88±76.48^{bc}	1348.40±3.60^{a}
5	1900.80±70.80^{ab}	1903.97±18.83^{ab}	1892.04±9.24^{ab}	1853.57±79.07^{b}	1971.52±48.31^{a}
6	2676.00±100.80^{b}	2645.74±20.26^{b}	2629.00±91.00^{b}	2644.79±35.20^{b}	2896.75±40.75^{a}
Body Weight Gain (g.)					
4	457.40±19.00	510.24±50.90	575.42±5.62	510.60±12.36	578.35±7.78
5	731.88±81.00	651.54±2.34	673.32±16.84	654.69±2.59	623.11±51.91
6	755.20±29.20^{b}	741.77±83.42^{b}	736.96±31.76^{b}	791.22±43.86^{b}	925.23±7.56^{a}
4-6	1964.48±7.20^{b}	1903.56b±32.08^{b}	1985.70±59.30^{ab}	1956.51±71.08^{b}	2126.93±52.13^{a}

Means in the same row with different superscripts were significantly different (P<0.05). * treatment mean :control with out adding oil , E1 =0.5 % EPO , E2= 1% EPO , G1 = 0.5 % GSO and G2=1 % GSO.

Table (5) showed no significant differences in feed consumption among birds of different treatments during the fourth and fifth weeks, in the sixth week there was a significant decrease (P<0.05) in the feed consumption average of the control treatment birds compared with the other experiment treatments, in the other handthe overall feed consumption average was significantly increased (P<0.05) for the treatment E2 compared with the control treatment and the treatment E1, and did not differ significantly from both G2 and G1 compared with the treatments at the end of the experiment in the sixth week, and this significant improvement (P <0.05) in the total feed conversion ratio was also for G2 compared to E1, And did not differ significantly from the other treatments and there were no significant differences in the percentage of the recovery and all the experiment treatments.

Table 5: Effect Of Evening Primrose Oil (EPO) And Grape Seed Oil (GSO) On Feed intake And Feed Conversion Ratio Of Broiler

Age week	Treatment*				
	Control	**E1**	**E2**	**G1**	**G2**
Feed intake (g.)					
4	879.512±6.96	816.00±96.72	869.72±11.80	825.32±78.04	869.84±11.92
5	1146.75±3.16	1079.58±70.66	1128.20±34.20	1068.08±9.12	1101.04±4.40
6	1219.52±5.60^{b}	1393.53±63.72^{a}	1316.12±48.20^{b}	1374.47±56.94^{a}	1326.03±22.7^{a}
4-6	3245.80±1.80^{b}	3239.11±3.60^{b}	3308.04±2.20^{a}	3267.81±30.21^{ab}	3276.31±6.45^{ab}
Feed Conversion Ratio (g./g.)					
4	2.04a±0.05	1.59b±0.03	1.51b±0.005	1.66b±0.021	1.50b±0.003
5	1.58±0.19	1.65. ±0.11	1.66±0.009	1.63±0.007	1.77±0.14
6	1.57±0.006^{c}	1.92±0.43^{a}	1.80±0.13^{ab}	1.73±0.02^{b}	1.43±0.001^{c}
4-6	1.65±0.06^{ab}	1.73±0.11^{a}	1.66±0.04^{ab}	1.67±0.04^{ab}	1.55±0.04^{b}

Means in the same row with different superscripts were significantly different (P<0.05). * treatment mean :control with out adding oil , E1 =0.5 % EPO , E2= 1% EPO , G1 = 0.5 % GSO and G2=1 % GSO.

Table (6) also showed no significant differences in the percentage of the thigh and drumstick between the treatments that used in the experiment, as for the percentage of the breast piece, the treatment G2 significantly increased the other treatments and did not differ significantly from the control treatment.

Table 6: Effect Of Evening Primrose Oil (EPO) And Grape Seed Oil (GSO) On dressing percentage , breast , thigh , drumstick.

Carcass Quality %	Treatment*					Sg.
	Control	**E1**	**E2**	**G1**	**G2**	
Dressing	76.02±0.24	75.42±0.59	76.53±0.49	76.13±0.62	75.71±0.86	NS
Breast	38.06±1.22^{ab}	36.92±1.52^{b}	36.83±1.27^{b}	36.26±1.84^{b}	39.18±0.73^{a}	*
Thigh	13.52±0.62	13.16±0.19	12.98±0.37	13.67±0.18	13.11±0.44	NS
Drumstick	11.92±0.81	11.58±0.40	11.23±0.52	10.98±0.14	11.44±0.30	NS

Means in the same row with different superscripts were significantly different (P<0.05). * treatment mean :control with out adding oil , E1 =0.5 % EPO , E2= 1% EPO , G1 = 0.5 % GSO and G2=1 % GSO.

Table (7) showed a significant increase in the relative weight of the liver in the birds of E1 and E2 treatments with weights of 2.18% and 2.36% respectively when compared to G2 and G1, but they did not differ significantly from the control treatment. The same table showed no significant differences in the relative weight of the gizzard, heart and abdominal fat for all the treatments of this experiment.One of the results obtained from this study is observing a significant increase in the average of body weight and the weight increasing of G2 treatment birds which 1% of grape seed oil (GSO) had used in its diets at the age of 6 weeks at the end of the experiment.

Table 7: Effect of Evening Primrose Oil (EPO) And Grape Seed Oil (GSO) on dressing percentage, breast, thigh, drumstick.

Carcass Quality %	Treatment*					Sg.
	Control	E1	E2	G1	G2	
Liver	2.02±0.05^{ab}	2.18±0.18^{a}	2.36±0.06^{a}	1.70±0.17^{b}	1.83±0.08^{b}	*
Gizzard	1.29±0.03	1.35±0.07	1.22±0.08	1.45±0.17	1.28±0.06	NS
Heart	0.63±0.05	0.53±0.03	0.61±0.03	0.52±0.02	0.62±0.04	NS
Abdominal fat	1.20±0.02	1.21±0.03	1.27±0.01	1.19±0.06	1.15±0.4	NS

Means in the same row with different superscripts were significantly different (P<0.05). * treatment mean :control with out adding oil , E1 =0.5 % EPO , E2= 1% EPO , G1 = 0.5 % GSO and G2=1 % GSO.

This increase was also obvious at the age of 4 and 5 weeks maybe due to the grape seed oil which is rich in Polyphenolys and a good source of Flavonoid, and Pronathoayanidis is considered as the main component of seeds and grape oil and these phenolic compounds have a role in the protection of nutrients from oxidation during digestion, thus improving nutrient digestibility and protecting intestinal epithelium from oxidative stress resulting from nutrient factors or bacterial metabolism (Goni et al., 2007). Phenolic compounds also play an important role in their effect on intestinal flora as they reduce the number of pathogenic bacteria (Clostridia, Bacteroides, Propionibacteria) and increase the number of beneficial bacteria (Bifidgbacteria, Lactobacilli), Thus improving the health status of birds, which is reflected in the productive performance (viveros et al., 2011). The reason of the obvious significant improvement in feed consumption and food conversion ratio for the treatments which 1% of GSOand EPO was used in its treatments during the last week of the experiment (week 6) and the overall average to the efficiency ofnatural antioxidant in grape seed oil and spring flower oil outside the body by protecting fats and unsaturated fatty acids from oxidation and rancidity in the diets outside the body by inhibiting the formation of lipid peroxidation and produce the free radical resulting from fat oxidation causing a decrease in the nutritional value of fat and a significant reduction in the ability of energy utilization and thus lead to increase the utilization of the fats of the diet and increase energy utilization which is freed from fat metabolism, this is reflected on the improvement in the food conversion ratio of the treatments G1, G2, and E2 (Berens et al., 2008). The results of Figure (1) showed that the treatments which used EPO and GSO oil were highly effective as an antioxidant generator in controlling the fat oxidation in the stocked chicken meat for 30 days as these treatments recorded a significant decrease in Malondialdehyde (MDA) compared with the control treatment. The treatment G2 has showed the highest antioxidant effect in inhibiting fat oxidation in chicken meat without the treatments, with a significant decrease in MDA from G1. The results showed no significant differences between E2, E1 and G1 in MDA level in the stocked chicken meat. This was a significant decrease compared to the control treatment. This antioxidant effect of the treatments which used EPO and GSO is due to the high capacity of phenolic compounds in grape seed oil GSO and EPO to inhibit fat oxidation by inhibiting the free radical activity and increasing the first phase of oxidation process, This is reflected in the slow formation of hydroxyroxides and hence peroxide and as a result, the amount of MDA decreases (Kanbur et al., 2011; Wang et al., 2008).

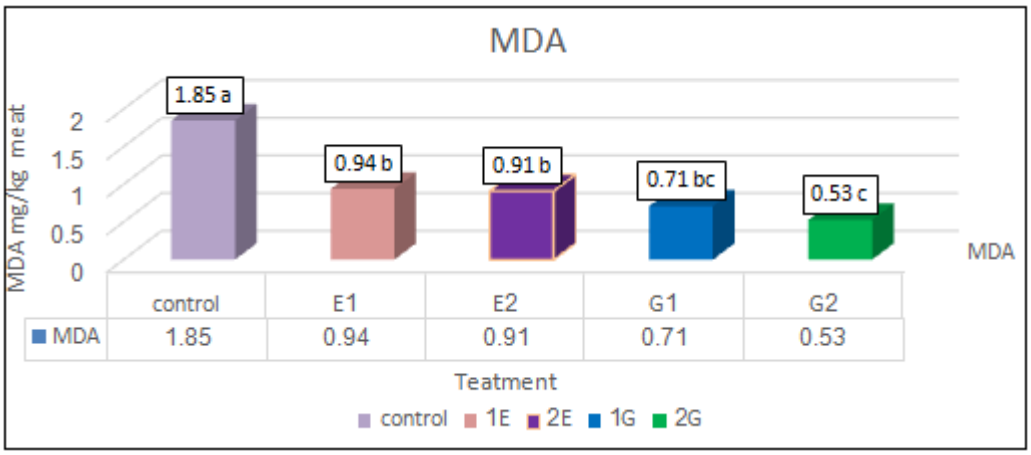

Figure 1: Effects of evening primrose oil (EPO) and grape seed oil (GSO) on meat malondialdehyde concentration (MDA) of broiler.Means in the same columns with different superscripts were significantly different (P<0.01). Treatment mean: control without adding oil , E1 =0.5 % EPO , E2= 1% EPO , G1 = 0.5 % GSO and G2=1 % GSO.

Figure 2 showed a significant increase in the level of Prostaglandin (PGE2) in the blood plasma of the treatment E2 birds, which used 1% of EPO oil in its diets and the treatment G2 which used 1% of GSO oil and did not differ significantly from E1 which used 0.5% of EPO oil. Compared with G1 and the control treatment no significant difference was observed between G1 and E1 in PGE2 concentration in blood plasma. The control treatment has recorded lower level of PGE2 in blood plasma in this study. The increasing of PGE2 level in the birds blood which used EPO (E1,E2) in its diets and in the diets which used GSO oil (G1,G2) is due to contain these oils of a high amount of polyunsaturated fatty acid (PUFA), these fatty acids creates a substrate for cyclooxygenase and lipoxygenase enzymes on plasma membranes that convert these into local hormones – eicosanoids. Eicosanoids such as (prostaglandins, leukotriene and hydroxyl FA) subsequently influence a range of metabolic activities of the organism such as inflammation, bleeding, vaso constriction, blood pressure or immune function (benatti et al ,2004 ; lisiak et al , 2013). The reason may also be due to the containment EPO oil of GLA out of total FA. GLA is an intermediated in conversion of linoleic acid – LA to arachidonic acid –AA (horrobin, 1998). This PUFA serve as precursors of metabolites (such as PGE2) regulating critical biological function (certik and shimizu, 1999). PGE1 and PGE2 are particularly important in controlling on the levels of insulin and cAMP and controlling the ratio between age and maturity or the reduction of the proportion of hormones such as growth hormone GH. The growth hormone also reverses the role of antioxidant insulin it inhibits the amount of glucose intake by the tissue. PGE2 has an important role in raising the body's immunity and resistance to many diseases (Rashad, 2012), which reflects positively on improving the production performance and the general condition of birds which EPO oil and GSO has added to its diets and increasing the level of PGE2 birds of these treatments in this study. Table (8) shows the effect of using EPO and GSO oil in the composition of fatty acids for the poultry meat which is used in this study. There were no significant differences in the percentage of palmetic, palmotic, stearic acid and arashidone among the different treatments, however, a significant increase was observed in the ratio of linoleic acid to all treatments which used EPO and GSO oil compared with the control treatment, the significant increasing was obvious in the treatments G2, G1 and then E2, E1 compared with the control treatment which it recorded the lowest ratio. As for α-Linolenic Acid, the highest ratio of EPO and GSO oil was recorded with a significant increase in the treatments G2, G1, E2 and E1 compared to control treatment.

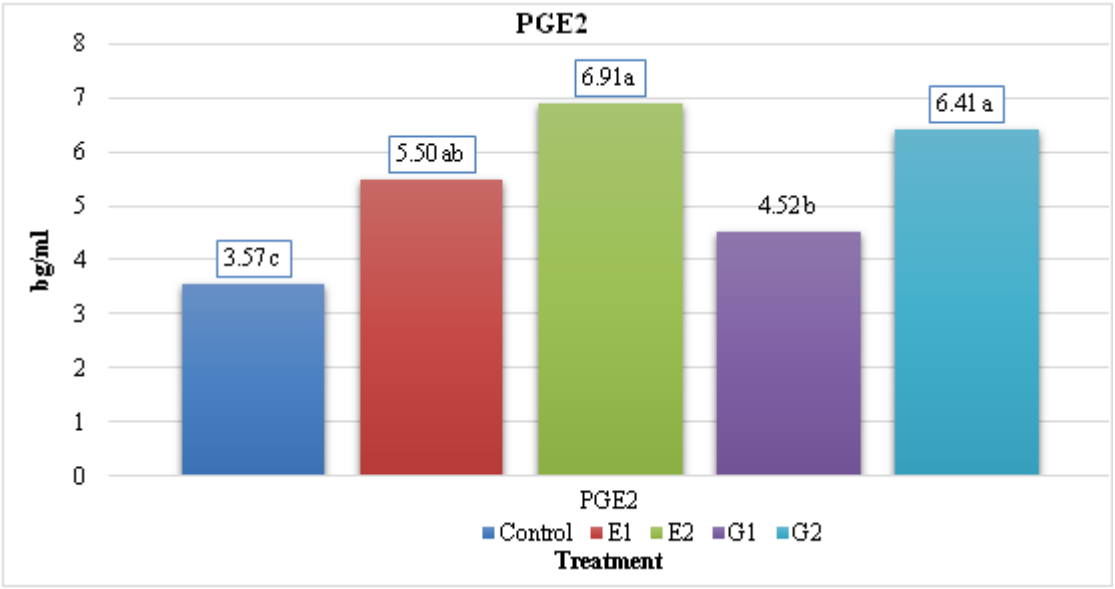

Figure 2: Effects of evening primrose oil (EPO) and grape seed oil (GSO) on plasma blood prostaglandins concentration (PGE2) of broiler.Means in the same columns with different superscripts were significantly different (P<0.01). Treatment mean: control without adding oil, E1 =0.5 % EPO, E2= 1% EPO, G1 = 0.5 % GSO and G2=1 % GSO.

The Table (8) showed a clear linear increase in the level of the monounsaturated fatty acids and multiple acids (α-linolenic acid, Linoleic, Oleic) with the increase of the added ratios of EPO and GSO oil in the diets of experiment, Lopez et al. (1999) noticed that the addition of grape seeds instead of fish oil led to a reduction in the level of saturated fatty acids in the meat of birds while an increase in monounsaturated fatty acids, this increase may be due to GSO oil contains high levels of oleic acid and the same result was also observed by Terez et al (2010) in breast and thigh meat when EPO oil was used in the diets of broilers, this increase in the ratio of unsaturated fatty acids (oleic, alanolic, alpha-linolenic) can be of great importance in terms of production of functional chicken meat, The presence of these fatty acids in the meat can reduce the human injury to many diseases (Siro et al., 2008).

Table 8: Effect of Evening Primrose Oil (EPO) And Grape Seed Oil (GSO) in diets on fatty acid composition of broiler meat

fatty acid composition %	Treatment*					Sg.
	Control	E1	E2	G1	G2	
Palmitic acid	17.85±1.09	17.12±2.00	16.72 ±1.36	16.45 ±2.30	16.32 ±1.25	NS
Palmitoleic acid	4.22±0.33	2.74 ±0.25	2.35±0.45	3.81±0.51	3.37 ±0.22	NS
Stearic acid	4.97±1.15	4.68±1.23	4.71±1.12	4.84±1.50	5.02±1.90	NS
Oleic acid	29.19 ±2.15^{a}	28.04 ±3.63 ^{a}	28.62 ±4.21 ^{a}	25.82 ±3.45^{b}	25.64 ±2.29^{b}	*
Linoleic acid	19.58 ±1.12^{c}	41.50 ±6.32^{a}	41.42 ±65.25^{a}	21.80 ±2.14^{b}	22.02±3.18^{b}	*
γ-Linolenic acid	3.80 ±0.15^{b}	4.5 ±0.17^{a}	4.08 ±0.05^{a}	3.96 ±0.06^{a}	4.02 ±0.04^{a}	*
Arachidonic acid	1.42±0.01	2.51±0.03	2.94±0.01	2.45±0.02	2.81±0.03	NS

Means in the same row with different superscripts were significantly different (P<0.05). * treatment mean :control with out adding oil , E1 =0.5 % EPO , E2= 1% EPO , G1 = 0.5 % GSO and G2=1 % GSO.

Meanwhile, compared to their saturated counter parts, unsaturated fatty acids are essential for the production of healthier meat and the establish meat of an appropriate balance between n-6 and n-3 poly unsaturated fatty acids (vural; 2003).

We conclude from this study that the use of 1% of EPO and GSO oil has generally improved the productive performance of birds, EPO and GSO oil can be considered as powerful antioxidants that can prolong the life span of meat naturally. Using EPO and GSO oil has increased the level of unsaturated fatty acids (alpha-linoleic, linoleic and oleic) in chicken meat, it is therefore possible to produce functional chicken meat rich in unsaturated fatty acids. Using EPO and GSO has raised the immune level of PGE2 in the blood of birds.

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