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Effect of Type of Vegetable Oil and Vitamin C on Some Productive Qualities of Broiler Breeders

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Abstract

THE RESEARCH was conducted on broiler breeders (Ross 308) to determine the effect of flax oil, palm oil, and vitamin C on productive performance and egg quality. The breeders were divided into five treatments (20 chickens and 4 roosters/treatment): the first treatment (control), the second treatment (2% flax oil), the third treatment (2% flax oil + vitamin C 300 mg/kg feed), the fourth treatment (2% palm oil), and the fifth treatment (2% palm oil + vitamin C 300 mg/kg feed). The results showed the significant superiority of the productivity indicators for all treatments (P≥0.05) compared to the control treatment of the characteristics of the number, mass, and percentage of egg production H.D% and improved the food conversion factor significantly, while the weight of eggs decreased significantly in all treatments except for the treatment of palm oil and vitamin C did not differ significantly compared to the control.

Keywords: vitamin C, palm oil, flax oil, broiler breeders, egg.

Introduction

Poultry products (eggs and meat) are one of humans' most important food sources. Eggs are of high nutritional value because they contain protein and a good percentage of fats, minerals, and vitamins [1], and adding oils and fats to chicken diets has become a widespread practice in our time as oils give more energy than twice the energy given by carbohydrates [2,3,4], and adding oils or fats to the diet improves the palatability of the feed material and reduces the rapid passage of food within the gut, allowing better metabolism [5,6]. In recent years it has been observed that fats and oils tend to react with oxygen (oxidation), which negatively affects human health when the proportion of polyunsaturated fatty acids (PUFA) in the cell membrane and ribosomes increases, which may lead to genetic mutations or cellular death due to the formation of lipid peroxides [7,8].

Palm oil contains 50% saturated fatty acids that are associated with cholesterol by the ester bond. Palm oil is an energy-rich nutrient that can be practically used in poultry diets, as each unit of it is equivalent to two units of carbohydrates in terms of energy production in addition to being a good source of carotene and to copherol [9,10].

Recent research has recently turned to flax oil as it is rich in polyunsaturated acids, especially type N-3 such as linolenic acid and the use of flax oil in poultry diets does not significantly increase the content of polyunsaturated fatty acids in the content of chicken meat [11, 12].

Recent research has focused on the importance of cellular antioxidants. Their use has been popularized in recent years for their importance in rebuilding damaged tissues and maintaining optimal growth and production states. Vitamin C is one of the most powerful natural water-soluble antioxidants. Its

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action lies as an antioxidant through its sweep of effective oxygen varieties [13, 14], and free radicals and reduces oxidative stress, and adding vitamin C to the chicken diet improves the thickness of the shell, because it reduces Stressful effects regulate blood pH and increase calcium absorption [15,16,17], the study aimed to identify the effect of vegetable oil type and vitamin C on some productive qualities and egg quality of broiler breeders (Ross 308).

Material and methods

The research was carried out in the poultry field of the Department of Animal Wealth, College of Agriculture and Forestry, University of Mosul. The study used broiler broilers (Ross 308) that were prepared from the Broiler mother's project /Erbil at 43 weeks. They were raised according to standard conditions for 12 weeks and distributed to 5 treatments (20 hens and 4 roosters/treatment) in 4 replicates (5 hens and 1 rooster/replicate). The first treatment (control) was fed a standard diet; the second treatment was fed a standard diet supplemented with (2% flax oil), the third treatment was fed a standard diet supplemented with (2% flax oil + vitamin C 300 mg/kg feed), the fourth treatment was fed a standard diet supplemented with to which (2% palm oil), the fifth treatment was fed a standard diet supplemented with (2% palm oil + vitamin C 300 mg/kg feed). Eggs were collected twice daily and counted, and the percentage of egg production (HD%) was calculated [18]. The process of weighing the eggs was carried out separately for each replicate using a sensitive scale and dividing the total weight of the eggs by the number produced the average egg weight for the replicate daily. Which was calculated weekly and every 4 weeks. During the egg production period, the mass of eggs produced weekly was calculated and the necessary feed conversion factor was calculated to produce 1 kg of eggs weekly and every 4 weeks. The data were analyzed statistically using a completely randomized design (C.R.D) and using the program [19] and to determine the significance of the differences between the means we used Duncan multiple range test [20].

Results and discussion

Table (1) shows the results regarding the number of eggs in the first period from the beginning of the 45th week until the end of the 48th week of life. Adding vitamin C to flax and palm oil led to a significant increase (a≥0.05) in the number of eggs compared to not adding it. The flax oil treatment with added vitamin C did not differ significantly from the control treatment for each of them. As for the rest of the treatments, they decreased significantly compared to the control treatment, especially the flax oil treatment, which decreased significantly from all treatments, and in the second period from the beginning of the 49th week until the end of the 52th week and the third period of from the beginning of the 53th week until the end of the 56th week of life, all treatments outperformed significantly (a≥0.05) compared to the control treatment. The number of eggs increased significantly in the overall period from the beginning of the 45th week until the end of the 56th week of life in all treatments compared to the control group. The results are Above; I agreed with the results referred to in the study of [21] on breeders of broiler chickens in that adding vitamin C to the diet led to a significant improvement in productive traits, and the results agreed with the results of the researcher [22], who did not There is a significant effect on the number of eggs of laying hens fed on diets containing 5% vegetable oil 2.5% vegetable oil + 2.5% flax oil and 5% flax oil. The results also agreed with the results reported by [16] about the use of vitamin C at a concentration of 300 mg/kg feed as an antioxidant in the diets of Habbard laying hens.

The results were significantly higher in the number of eggs compared to the control group. The reason is attributed to the ability of vitamin C to increase the number of eggs produced by inhibiting the secretion of corticosterone from the adrenal gland and then stimulating the anterior lobe of the pituitary gland to secrete sex-stimulating hormones (F.S.H. and L.H.), thus increasing the number of eggs [16].

TABLE 1. The effect of flax oil, palm oil, and vitamin C treatment on the total number of eggs for broiler breeders

Periods	Treatment				
	Control	Flax oil 2%	Flax oil 2% and vitamin C 300 mg/kg feed	Palm oil 2%	Palm oil 2% and vitamin C 300 mg/kg feed
Age 45-48 weeks	66.25± 0.94^{a}	52.50± 0.64^{d}	66.00 ±1.08^{a}	55.50± 0.64^{c}	61.00± 0.57^{b}
Age 48-52 weeks	45.00± 0.40^{d}	59.50± 0.64^{b}	63.00± 0.70^{a}	54.25± 0.47^{c}	60.25± 0.62^{b}
Age 52-56 weeks	36.50± 0.64^{c}	53.75± 1.31^{a}	49.75± 0.47^{b}	54.00± 1.15^{a}	56.25± 0.75^{a}
Total period is (45 – 56) weeks	147.75± 1.25^{c}	165.75± 0.62^{b}	178.75± 1.03^{a}	163.75± 1.03^{b}	177.50± 0.64^{a}

*Horizontally different letters mean a significant difference at the probability level (P ≥ 0.05).

Table (2) shows the effect of flax oil, palm oil, and vitamin C treatment on the total egg weight. Adding vitamin C to palm oil in the first period did not significantly increase egg weight (a≥0.05) compared to the control group, and it did not differ significantly. Adding vitamin C to flax oil compared to the treatment of flax oil alone, which decreased significantly from both the palm oil treatment and vitamin C and the control. As for the palm oil treatment, it decreased significantly from all treatments. About the weight of eggs in the second period, adding vitamin C to palm oil did not differ significantly from the Control group, while adding vitamin C to flax oil led to a significant decrease in egg weight compared to the flax oil treatment without vitamin C. Both of them decreased significantly compared to the control group. As for the palm oil treatment, egg weight decreased significantly compared to all treatments, and about egg weight. In the third period, there was no significant difference between the flax oil and vitamin C treatment and the palm oil treatment, which decreased significantly from the rest of the treatments and the control, which did not have a significant difference. As for the weight of eggs in the total period, the interpretation of the results was identical to that of the results in the second period. The above results agreed with the results of [23] when he added vitamin C at a concentration of 200 mg/kg to the diet of laying hens and did not find a significant difference in egg weight compared to the control group, and they agreed with the results of [24] When vitamin C was added to quail feed at a concentration of 200 parts per million of feed, no significant difference appeared in the average egg weight compared to the control group. The results agreed with the the researcher [25], who did not record a significant increase in egg weight when using a mixture of soybean oil and flax oil by 3%. The decrease in egg weight when treated with vegetable oils compared to the control treatment may be due to the increase in the number of eggs, as the results of the study show in Table (1).

TABLE 2. The effect of treatment with flax oil, palm oil, and vitamin C on the total egg weight (g) of broiler breeders

Periods	Treatment				
	Control	**Flax oil 2%**	**Flax oil 2% and vitamin C 300 mg/kg feed**	**Palm oil 2%**	**Palm oil 2% and vitamin C 300 mg/kg feed**
Age 45-48 weeks	69.27± 0.07[a]	66.60± 0.15[b]	66.20± 0.06[b]	65.61± 0.23[c]	69.00± 0.05[a]
Age 48-52 weeks	71.48± 0.11[a]	70.26± 0.15[b]	69.52± 0.19[c]	68.58± 0.07[d]	71.80± 0.10[a]
Age 52-56 weeks	69.98± 0.16[a]	70.47± 0.13[a]	68.98± 0.29[b]	68.85± 0.09[b]	70.04± 0.02[a]
Total period is (45 – 56) weeks	70.25± 0.03[a]	69.11± 0.11[b]	68.23± 0.07[c]	67.68± 0.05[d]	70.28± 0.03[a]

*Horizontally different letters mean there is a significant difference at the probability level (P ≥ 0.05).

Table (3) shows the results of the egg production percentage H.D. % in the first period, as adding vitamin C to both flax oil and palm oil led to a significant increase (a≥0.05) in the egg production percentage compared to not adding vitamin C to each of them and did not The flax oil treatment with added vitamin C differed significantly from the control treatment. All treatments recorded a significant decrease compared to the control treatment, except for the flax oil and vitamin C treatment, which did not differ significantly from the control treatment. About the percentage of egg production (H.D. %) in the second period, it was significantly superior to the oil treatment. Flax and vitamin C are first, and both the palm oil and vitamin C treatment and the flax oil treatment are second, and the palm oil treatment is third over the control treatment. Table (3) shows the significant superiority of the palm oil and vitamin C treatment in the third period over both the flax oil treatment and the flax oil and vitamin C treatment. The palm oil and vitamin C treatment did not differ significantly from the palm oil treatment, which in turn did not differ significantly from the flax oil treatment. All treatments were significantly superior to the control group, while the percentage of egg production (H.D. %) in the total period was not significantly affected by the palm oil and vitamin C treatment. Flax oil and vitamin C were significantly superior to the two treatments of palm oil or flax oil, which were not significantly different, and all treatments were significantly superior compared to the control group. The above results agreed with the results of the researcher [26], who showed that there was a significant increase in the egg production rate of breeders of broiler chickens that consumed 2.5% palm oil in their diet compared to the control group, and they agreed with the study of [27], which It was shown that the quails that ate flax oil were significantly superior to the control group in terms of egg production based on H.D. %. The results also agreed with what was stated by [28], that adding vitamin C to the diets of broilers leads to a significant

improvement in productive characteristics by increasing the percentage of egg production. The results may be attributed to the fact that the digestibility coefficient of fatty acids increases with age, especially saturated ones, due to increased secretion of the lipase enzyme and bile salts [6], which leads to an improvement in metabolic processes, which increases the rate of egg production. Adding vitamin C to the feed reduces stress in the bird's body by inhibiting the secretion of the stress hormone corticosterone from the adrenal cortex, which leads to an increase in egg production [29].

TABLE 3. The effect of treatment with flax oil, palm oil, and vitamin C on the percentage of egg production (H.D.%) for broiler breeders

Periods	Treatment				
	Control	Flax oil 2%	Flax oil 2% and vitamin C 300 mg/kg feed	Palm oil 2%	Palm oil 2% and vitamin C 300 mg/kg feed
Age 45-48 weeks	47.32± 0.67^{a}	37.50± 0.46^{d}	47.14± 0.77^{a}	39.64± 0.46^{c}	43.57± 0.41^{b}
Age 48-52 weeks	32.14± 0.29^{d}	42.49± 0.46^{b}	44.99± 0.50^{a}	38.75± 0.34^{c}	43.03± 0.44^{b}
Age 52-56 weeks	31.83± 0.36^{d}	46.80± 1.00^{b}	43.69± 0.81^{c}	47.97± 0.62^{ab}	49.28± 0.90^{a}
Total period is (45 – 56) weeks	37.09± 0.19^{c}	42.26± 0.50^{b}	45.27± 0.29^{a}	42.12± 0.24^{b}	45.29± 0.19^{a}

*Horizontally different letters mean there is a significant difference at the probability level (P ≥ 0.05).

Table (4) shows the effect of the treatments on egg mass in the first period from the beginning of the 45th week until the end of the 48th week of life, as adding vitamin C to palm oil or flax oil did not lead to a significant difference between them, which were significantly superior to the treatments of palm oil or flax oil. Flax was not significantly different, while all treatments decreased significantly (a≥0.05) compared to the control group. The results for egg mass in the second period from the beginning of the 49th week until the end of the 52th week of life did not differ significantly in the treatment of flax oil and vitamin C. The palm oil and vitamin C treatments were distinct from each other, which were significantly superior to the flax oil treatment and then to the palm oil treatment, and all treatments were significantly superior to the control treatment. The results were in the third period from the beginning of the 53th week until the end of the 56th week of life, regardless of whether vitamin C was added. It is added to palm oil, so there is no significant difference between the two treatments, which did not differ from the flax oil treatment, which was superior to the flax oil and vitamin C treatment, and all treatments were significantly superior to the control treatment, while the results for egg mass in the overall period from the beginning of the 45th week until the end of the 56th week were In terms of age, it was significantly superior to the palm oil and vitamin C treatment first, the flax oil and vitamin C treatment second, the flax oil treatment third, and the palm oil treatment fourth, and all of these treatments were significantly superior to the control treatment. The above results agreed with the study by researcher [27], who showed that quail birds that ate flax oil were significantly superior compared to the control group in terms of egg mass. The results agreed with the study of [30] on quail birds, which showed that consistently giving vitamin C at a concentration of 300 mg/kg of feed significantly increased egg mass compared to the control group. The increase in egg mass in all of these treatments results from the significant increase in the percentage of egg production for these treatments compared to the control group, as shown in Table (3).

TABLE 4. The effect of treatment with flax oil, palm oil, and vitamin C on egg mass (g) for broiler breeders

Periods	Treatment				
	Control	Flax oil 2%	Flax oil 2% and vitamin C 300 mg/kg feed	Palm oil 2%	Palm oil 2% and vitamin C 300 mg/kg feed
Age 45-48 weeks	32.64± 0.53^{a}	24.98± 0.35^{c}	31.19± 0.53^{b}	25.96± 0.24^{c}	30.09± 0.26 ^{b}
Age 48-52 weeks	22.97± 0.23^{d}	29.86± 0.32^{b}	31.28± 0.41^{a}	26.55± 0.23^{c}	30.90± 0.30 ^{a}
Age 52-56 weeks	22.29± 0.28^{c}	33.00± 0.73^{a}	30.13± 0.54^{b}	33.05± 0.42^{a}	34.52± 0.63 ^{a}
Total period is (45 – 56) weeks	25.97± 0.14e	29.28± 0.36^{c}	30.87± 0.22^{b}	28.52± 0.17^{d}	31.84± 0.15 ^{a}

*Horizontally different letters mean there is a significant difference at the probability level (P ≥ 0.05).

Table (5) shows the effect of the treatments on the food conversion factor in the first period from the beginning of the 45th week until the end of the 48th week of life, as adding vitamin C to flax oil or palm oil did not lead to a significant difference between them, which improved significantly compared to the flax oil treatment. The palm oil treatment, while the control treatment was significantly better than all the treatments, and about the food conversion factor in the second period from the beginning of the 49th week until the end of the 52nd week of life, all the treatments improved significantly compared to the control, while the flax oil and vitamin C treatment and the palm oil treatment were significantly better than all the treatments. Palm oil and vitamin C were significantly better than the palm oil treatment. The flax oil and vitamin C treatment improved significantly compared to the flax oil treatment at the probability level (a≥0.05). In the third period, from the beginning of the 53th week until the end of the 56th week of life, all treatments improved. Significantly compared to the control, the feed conversion factor also improved in the palm oil and vitamin C treatment compared to the flax oil and vitamin C treatment at the probability level (P ≥0.05). The overall period from the beginning of the 45th week until the end of the 56th week of life improved. The food conversion factor was significant in all treatments compared to the control while adding vitamin C to the flax oil treatment and the palm oil treatment led to a significant improvement in the food conversion factor between them compared to the flax oil treatment and the palm oil treatment at the probability level (P ≥0.05). The above results agreed with the results of [31], which showed a significant improvement in the feed conversion factor by adding flax oil to laying hens' diets compared to the control group. The results agreed with the researcher [25], showing that the best feed conversion factor for laying hens was He fed a mixture of 3% soybean and flax oil. The results agreed with the results of [32], which showed that adding vitamin C at a concentration of 250 mg/kg feed to the diet of laying hens improves the feed conversion factor. The reason for the improvement in the feed conversion factor for vegetable oil treatments may be attributed to the assimilation of fatty acids through the beta oxidative cycle of fat and the increase in the number of cycles due to the ratio of unsaturated oils: saturated oils, as well as through bile salts that form an emulsion with fats [33]. This helps with the action of the pancreatic lipase enzyme (Aguilar et al., 2013), thus increasing the efficiency of energy metabolism. Because vitamin C is an antioxidant and oils become rancid, so adding it to diets containing oils led to an increase in the benefit of oils, and this was shown in the increase in the number and percentage of production and mass of eggs in oil diets with added vitamin C (Tables 1, 3, 4) as adding vitamin C to diets improve food digestibility [34, 35], which was reflected positively in the significant improvement of the food conversion factor.

TABLE 5. The effect of treatment with flax oil, palm oil, and vitamin C on the feed conversion factor (gm feed/gm eggs) for broiler breeders

Periods	Treatment				
	Control	Flax oil 2%	Flax oil 2% and vitamin C 300 mg/kg feed	Palm oil 2%	Palm oil 2% and vitamin C 300 mg/kg feed
Age 45-48 weeks	5.03± 0.05^{d}	6.61± 0.11^{a}	5.27± 0.07^{c}	6.34± 0.04^{b}	5.48± 0.05^{c}
Age 48-52 weeks	6.99± 0.08^{a}	5.42± 0.06^{c}	5.11± 0.08^{d}	6.08± 0.05^{b}	5.24± 0.05^{cd}
Age 52-56 weeks	9.08± 0.32^{a}	6.26± 0.23b^{c}	6.59± 0.13^{b}	5.96± 0.14b^{c}	5.81± 0.12^{c}
Total period is (45 – 56) weeks	7.03± 0.11^{a}	6.10± 0.07^{b}	5.66± 0.05^{c}	6.13± 0.03^{b}	5.51± 0.03^{c}

*Horizontally different letters mean there is a significant difference at the probability level (P ≥ 0.05).

Conflicts of interest

There is no conflict of interest.

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Conclusions

The addition of flax oil with vitamin C and palm oil with vitamin C for broiler breeders' diets led to significant superiority in the results of the productive indicators for all treatments and for the characteristics of the number, mass, and percentage of egg production H.D% and significantly improved the food conversion factor. In contrast, the weight of eggs decreased significantly in all treatments except for the treatment of palm oil and vitamin C did not differ compared to the control.

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تأثير نوع الزيت النباتي وفيتامين C في بعض الصفات الإنتاجية ونوعية البيض لإمهات فروج اللحم

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اجري البحث على أمهات فروج اللحم نوع (Ross 308)، لمعرفة تأثير زيت الكتان وزيت النخيل وفيتامين C في الأداء الإنتاجي ونوعية البيض. قُسِّمَت الأمهات إلى 5 معاملات (20دجاجة و4 ديكة/معاملة)، المعاملة الأولى (سيطرة)، المعاملة الثانية (2% زيت الكتان)، المعاملة الثالثة (2% زيت الكتان + فيتامين C 300ملغم/كغم علف)، المعاملة الرابعة (2% زيت النخيل)، المعاملة الخامسة (2% زيت النخيل + فيتامين C 300ملغم/كغم علف). وبينت النتائج التفوق المعنوي للمؤشرات الإنتاجية لجميع المعاملات (أ≥0,05)مقارنةً بمعاملة السيطرة والخاصة بصفات عدد وكتلة ونسبة إنتاج البيض H.D% وتحسن معنوياً معامل التحويل الغذائي، أما وزن البيض فقد انخفض معنوياً في جميع المعاملات ماعدا معاملة زيت النخيل وفيتامين C لم تختلف معنوياً مقارنةً بمعاملة السيطرة.

الكلمات المفتاحية: فيتامين ج، زيت النخيل، زيت الكتان، امهات فروج اللحم، بيض.