Effect of basil seed powder, vitamin C and the mixing between them on the productive traits of heat-stressed broiler chickens

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Abstract

This study was conducted in the poultry field belonging to the Department of Animal Production / College of Agriculture / University of Kufa for the period from August 30, 2020 to October 4, 2020, for a period of 5 weeks. To know the effect of adding and mixing basil seed powder and vitamin C on the productive performance of heat-stressed broiler chickens. In the experiment, 300 unsexed broiler chicks were used, Ross 308 hybrid of one-day age, the chicks were randomly divided into 5 treatments (60 chicks / treatment) with 3 replicates per treatments. As each refined included 20 chicks with an average starter weight of 45 g and the treatments were as follows: T1 control treatment (without adding basil seed powder and vitamin C), T2 adding 4 g / kg of basil seed powder, T3 adding 6 g / kg of basil seed powder, T4 add 300 mg / kg of feed vitamin C, T5 adding 5 g / kg of feed basil seed powder + 150 mg / kg feed vitamin C.The results of the experiment showed that treatment T3 excelled on control and treatment T4 in the average live body weight at the fourth and fifth weeks of average of birds, and treatment T3 excelled on control and T4 in total weight gain and food conversion ratio. The two treatments T2 and T3 achieved a significant effect on the total feed consumption average compared to the control treatment. We conclude from this experiment the ability of basil seed powder to increase the productive performance of heat-stressed broiler chickens.

Key words: heat stress, basil seed powder, vitamin C, Ross 308

Introduction

The poultry industry is one of the fastest-growing industries in livestock production because of the genetic improvements in the commercial breeds of broilers, which led to a steady increase in the growth rate, which made them sensitive to high temperature due to the increase in heat resulting from the metabolic processes inside the body as a result of the speed of growth and the high efficiency of the average of feed conversion ratio and the lack of sweat glands through which it can reduce its severity stress (Yousaf et al., 2017 ;Surai et al., 2019). Heat stress is one of the common obstacles facing the poultry industry in tropical regions in general and in Iraq in particular due to high temperatures in the summer and for a period of more than six months of the year, which causes a decrease in the bird's resistance to diseases due to its complex and harmful effects that depend on the severity and duration of exposure to high temperatures (Tellez et al., 2017). Basil (O. sanctum) is one of the well-known medicinal plants that has several qualities, including anthelmintic, anti-bacterial, microbial, anti-inflammatory, and antipyretic, and has an effective role in improving the

performance of birds and improving blood standards in cases of stress that the bird is exposed to during the duration of its life cycle (Swathi et al., 2012). Vitamin C (ascorbic acid) is one of the compounds that play an important role in reducing heat stress by introducing it as a feed additive in the diet or drinking water, and it is an antioxidant compound that works to neutralize free radicals and works to improve villus size. It increases the intake of feed, and is a high-quality antioxidant used in the poultry industry to reduce the risk of heat stress. The bird's need for antioxidants increases due to the occurrence of oxidative stress generated by heat stress in order to reduce the damage of reactive oxygen species and thus improve performance (Ramnath et al., 2008). Vitamin C (ascorbic acid) is one of the compounds that play an important role in reducing heat stress by introducing it as a feed additive in the diet or drinking water, and it is an antioxidant compound that neutralizes free radicals works to improve villus size, and increases feed intake. It is also a high-quality antioxidant used in the poultry industry to reduce the risk of heat stress, The bird's need for antioxidants increases due to the occurrence of oxidative stress generated by heat stress in order to reduce the damage of reactive oxygen species and thus improve performance (Ramnath et al., 2008). The present study aims to evaluate the addition of different levels of crushed basil seeds and vitamin C (ascorbic acid) and the mixing between them in the diets of broiler chickens exposed to heat stress and to know its effect on the productive performance of broiler chickens.

Materials and methods

This study was conducted in the field of poultry, belonging to the Department of Animal Production, College of Agriculture, University of Kufa, for a period from August 30, 2020 to October 4, 2020, for a period of 5 weeks. In which the effect of adding (*Ocimum basilicum* L.) powder and vitamin C and mixing between them was studied to relieve heat stress in broiler chickens, the experiment included 300 unsexed broiler chickens, Ross308 hybrid at the age of one day with an average of 45 g.It was prepared from the Al-Anwar hatchery in Al-Muradiya / Babylon province, the chicks were divided into 5 treatments, each treatment included 60 chicks with 3 replicates (each replicates 20 chicks) (Areaaer et al., 2020). The transactions were divided as follows:

1- The first treatment (T1): control fed its birds on a diet without adding basil seed powder and vitamin C.

2- The second treatment (T2): Their birds were fed on a diet added to which 4g of basil seed powder for each kg of diet.

3- The third treatment (T3): Their birds were fed on a diet added to which 6g of basil seed powder for each kg of diet.

4- The fourth treatment (T4): Their birds were fed on a diet added to which 300 mg of Vitamin C for each kg of diet.

5- The fifth treatment (T5): Their birds were fed on a diet added to which 5g of basil seed powder + 150 mg of Vitamin C.

Feeding chicks

The chicks are fed, according to the recommendations of the producing company, with starter feed for a period of (1-10) days, and growing feed for a period of (11-24) days, and final feed for a period of (25-35) days. The feeds were prepared in the Al-Sbateen feed factory in Babylon province. According to the following table:

Table 1. the percentage of substances included in the diets used in the experiment

Feed material	Starter diet %	growth diet%	Final diet %
Crushed yellow corn	50.50	54.00	58.00
Soybean meal	36.00	32.00	27.50
Crushed wheat	8.00	8.00	7.00
Premix *	2.50	2.50	2.50
corn oil	1.50	2.00	3.50
Dicalcium Phosphate **	0.1	0.1	0.1
limestone	1.1	1.1	1.1
salt	0.3	0.3	0.3
Total	100	100	100
Total Calcium%	1.102	1.09	1.08
Available phosphorous%	0.74	0.72	0.71
Crude fiber%	2.30	2.41	2.45
Total lysine%	1.12	1.08	1.02
Methionine + Cysteine%	0.73	0.69	0.65
Crude protein / energy ratio	130.4	143.2	163.9

Study traits:

Each of the productive performance traits were studied, which included: live body weight average , weight gain average , weekly and total feed consumption rate, weekly and total feed conversion ratio.

statistical analysis:

The data were analyzed for the studied traits using CRD Completely Randomized Design to know the effect of the different treatments. The significance of the differences between the coefficients was tested using the Duncan (1955) polynomial test at 0.05 significance level and using the SAS (2012) statistical program in the statistical analysis.

Results and discussion:

Average weekly live body weight

Table 2. shows the effect of adding basil seed powder and vitamin C and mixing them on the average weight of heat-stress birds at different ages, where the results of the statistical analysis indicated that there were no significant differences between all treatments when fed with different levels of basil seed powder and vitamin C, and mixing between them during the first three weeks from the age. In the fourth week, the results indicated the presence of significant differences at the level of ($P < 0.05$), where treatment T3 significantly excelled it by recording the highest average live body weight, which reached 1431.07 g / bird, excelled on the two treatments T1 and T4, which recorded 1367.83 and 1362.40 g / A bird respectively .While it did not differ with the two treatments T2 and T5, which recorded 1379.67 and 1380.80 g / bird, respectively, and the treatments T1, T2, T4 and T5 did not differ between them. In the fifth week of the age of the chicks. The results indicated that the treatment T3 birds gave the highest value, which amounted to 1927.13 g / bird, excelled on the two treatment T1 and T4 birds, which gave 1851.03 and 1850.13 g / bird, respectively. While it did not differ with the two treatments T2 and T5, which amounted to 1871.00 and 1880.80 g / bird, and the treatments T1, T2, T4 and T5 did not differ between them. Where, the fourth treatment result did not agree with Selvam et al. (2018) who indicated that there was a significantly excelled in the average live body weight when adding vitamin C at a concentration of 300 mg / L to the heat-stress broiler chickens.The results of the third treatment and the fifth treatment were in agree with Jahejo et al. (2019) who obtained a significant increase in the average live body weight when treating the broiler chickens diet Hubbard 380 strain heat-stress with basil seed powder at a concentration of 5 g / kg and vitamin C at a concentration of 200 mg / L. It also agreed with Chitra (2020), who obtained a significant increase in live body weight of thermally stressed broilers when adding basil seed powder at 1% concentration. The excelled of chicks fed on a diet containing basil seed powder and vitamin C may be due to the direct role of basil seed powder and vitamin C in reducing the harmful effect of high temperatures due to the reduction in energy consumption in metabolic processes, including panting, which contributes to preventing dehydration the birds or, the nutrition strategy used in this study when heat stress conditions have an important role in mitigating the negative effects of high temperature (Sultan, 2016). Or, the significant increase can be due to the role that the higher concentration of basil seed powder plays in stimulating the digestive system of the bird by increasing the production of digestive enzymes and improving the use of digested products, and this is due to the improvement of liver function. In addition to its role in enhancing the immune status of the bird and inhibiting the growth of pathogenic microorganisms, especially the intestinal microbes present in the digestive system, which is positively reflected in the increase of productive traits indicators .In addition to its role as an antioxidant and its inhibitory effect against heat stress by reducing the secretion of corticosterone directly (Padurar et al. 2008 and Mode et al. 2009). Or, the improvement may be due to the basil seed powder containing fat-soluble substances, essential fatty acids, and growth promoting substances (Hernandez et al., 2004).In addition to the role of basil seed powder in improving the antispasmodic and carminative properties, as it is one of the medicinal plants that is characterized by its role as anti-oxidant and anti-harmful bacteria (Hussain et al., 2008).

Table 2. Effect of adding basil seed powder (Ocimum basilicum L.) and vitamin C to reducing heat stress and its effect on average live body weight (gm) for weeks of the experiment.

Treatments	Mean ± Standard error (gm)				
	first week	second week	third week	fourth week	fifth week
T1	165.50 8.50±	446.96 13.52±	852.73 14.99±	1367.83 b 15.07±	1851.03 b 21.39±
T2	164.63 7.62±	442.90 13.62±	845.37 13.42±	1379.67 ab 14.57±	1871.00 ab 21.07±
T3	169.73 7.45±	454.90 12.56±	875.86 12.85±	1431.07 a 20.89±	1927.13 a 14.74±
T4	173.47 7.59±	453.23 13.22±	845.73 16.66±	1362.40 b 17.70±	1850.13 b 20.35±
T5	170.40 9.04±	443.80 14.29±	860.96 14.66±	1380.80 ab 11.83±	1880.80 ab 23.71±
The level of significance	*N.S*	*N.S*	*N.S*	*	*

Average weekly and total weight gain

This trait an indication of the growth rate and speed of broiler birds, so the poultry sector breeder is interested in improving this trait as much as they can during the maximum possible period of the productive age of the project to reach the highest profit output.Through that, the results of the statistical analysis were shown in Table 3. There were no significant differences between all the treatments at the five weeks of the bird's age. As for the average total weight gain of birds, the treatment T3 achieved a significantly excelled at the level of ($P < 0.05$) and gave the highest average of weight gain, which amounted to 1881.87 g / bird, excelled that of the control and T4 treatments, which recorded 1805.67 and 1804.77 g / bird, respectively. While it was not significantly different with the two treatments T2 and T5, which recorded 1825.57 and 1835.37 g / bird, respectively, and the treatments T1, T2, T4 and T5 did not differ between them. these results agree with Abioja et al. (2011) who did not obtain a significant response in the overall average of weight gain when adding vitamin C at a concentration of 500 mg / L to broiler diet Anak 2000 strain at 56 days of age. This result was also in agree with Chitra (2020), who obtained a significant increase in the overall weight gain rate of thermally stressed broilers when adding basil seed powder at a concentration of 1%. It also agree with Almrsomi et al. (2021) who obtained a significant increase in the total weight gain average when adding different levels of ginger plant powder to the broiler

chickens Ross308. The significant increase in the occurrence may be due to the content of basil seeds (such as Linalool, Estragole and Eugenol), which directly affect the increase in the body's immunity as they are anti-microbial substances and lead to sterilization of the digestive system and this is reflected in the improvement of the rate of weight gain of broilers, as well as its effectiveness in improving The rate of absorption of main mineral ions in the diet, which positively affects the weight gain (Ahmed et al., 2015), .Or it may be related to the components of the basil seed powder, represented by flavonoids, tannins, glycerine, and saponins, which are both medically and nutritious for broilers (Jahejo et al., 2019). Al-Issawi (2013) also showed in his study on the effect of basil that it actually stimulates the pancreatic gland, which reflects positively on its secretions, and there is an increase in digestive enzymes. This allows for the digestion of the largest amount of food and amino acids and their increased absorption from the gastrointestinal tract, which is positively reflected on the productive performance of birds.

Table 3. Effect of adding basil seed powder (Ocimum basilicum L.) and vitamin C to reducing heat stress and its effect on average weekly increase (g) for weeks of experiment

Treatments	Mean ± Standard error (g)					
	first week	second week	third week	fourth week	fifth week	Total weight gain
T1	120.13 8.33±	281.47 12.63±	405.77 1.63±	515.10 0.66±	483.20 30.40±	1805.67 b 21.16±
T2	119.20 7.61±	278.27 17.88±	402.47 9.78±	534.30 9.82±	491.33 6.49±	1825.57 ab 21.01±
T3	124.47 7.54±	285.17 11.51±	420.97 12.56±	561.87 28.96±	496.07 6.14±	1881.87 a 14.76±
T4	128.10 7.36±	279.77 18.26±	392.50 3.44±	518.33 8.17±	487.73 10.07±	1804.77 b 20.43±
T5	124.97 8.81±	273.40 13.05±	410.50 22.74±	519.83 16.44±	500.00 12.13±	1835.37 ab 23.47±
The level of significance	*N.S*	*N.S*	*N.S*	*N.S*	*N.S*	*

Average weekly and total feed consumption

The efficiency of the productive performance of poultry farming projects is an explicit reflection of the quality and balance of the available nutrients in feed and drinking water and the extent of direct benefit from them, especially with regard to the qualitative aspect of

choosing the materials included in their composition, quantities and combinations. The results of (Table 4) indicate that the addition of different levels of basil seed powder and vitamin C and mixing them to the diet had a significant difference in the amount of feed consumed with the age of the chicks. The results of the statistical analysis indicated the presence of significant differences at a probability level (P <0.01) during the chicks reaching the age of 7 days. Treatment T5 recorded significantly excelled on all other treatments in the experiment, achieving the highest average for the amount of feed consumed of 142.00 g / bird. While treatment T4 recorded consumption of the lowest amount of feed at a rate of 117.46 g / bird without being significantly different with treatments T1, T2 and T3. The order varied when the chicks reached 14 days of age, where significant differences were found in the amount of feed consumed at a probability level P <0.05) due to the effect of adding different levels of basil seed powder and vitamin C and mixing them to the diet. Treatment T2 achieved significantly excelled by registering the highest average of consumed feed, which amounted to 379.80 g / bird, on the other treatments, and it did not differ significantly with treatment T3. On the other hand, the control treatment recorded the lowest average of feed consumption of 332.70 g / bird, which in turn did not differ significantly with the two treatments T4 and T5, which were recorded 341.30 and 352.00 g / bird, respectively. The matter continued at the third week of the life of the thermally stressed broiler chicks. As the feeding treatments added to the diet caused significant differences between the experimental treatments at a probability level (P <0.05)), treatment T3 recorded the largest amount of feed consumption during this period by achieving the highest average of 642.40 g / bird, excelled on all other treatments.Whereas, it did not differ significantly with treatment T2, which recorded 628.63 g / bird, which in turn did not differ significantly with the treatments T1, T4 and T5, which recorded an average of 621.56, 622.06 and 621.9 g / bird, respectively. As for the fourth week of the age of the broiler chicks, the matter did not change, where the treatments of adding different levels of basil seed powder and vitamin C to the diet had a significant effect during this age period, and the results of the same table showed the presence of significant differences between the treatments.Treatment T3 achieved the largest amount of feed at an average of 876.63 g / bird, excelled to treatment T4 and control treatment only, without having a significant difference with the two treatments T2 and 5T, which achieved an average of 873.33 and 870.23 g / bird, respectively. On the contrary, treatment T4 recorded the lowest average feed consumption, which was 840.97 g / bird, which was not significantly different from the control treatment, which achieved an average of 841.07 g / bird. The results of the same table also showed that there were significant differences between the treatments at a probability level (P <0.05) caused by the levels of adding basil seed powder and vitamin C to the diet when the broiler chicks reached the fifth week.Treatment T2 significantly excelled its consumption of the highest rate of feed consumed of 916.97 g / bird, excelled on treatment T5 without having a significant difference with the other treatments, while the lowest rate of feed consumption was recorded at treatment T5, which was 869.30 g / bird without differing significantly. With the two treatments T3, T4 and the control treatment, which were (882.72, 905.73 and 889.97) g / bird, respectively. As for the total feed consumption average, the results indicated in Table 4. The superiority of treatment T2 by registering the highest average of consumed feed, which amounted to 2807.13 g / bird, which in turn did not differ significantly with the two treatments T4 and T5, which reached 2827.63

and 2855.73 g / bird, respectively. Where, treatment T2 recorded the highest average of feed consumed and thus excelled on treatment T5. The results of the two treatments T4 and T5 agreed with what was shown by the results of Kolapo et al. (2002), who confirmed that the addition of vitamin C at different levels under heat stress conditions did not significantly affect the feed consumption average of broilers.The results of the two treatments T2 and T3 were in agreement with what Prajapat et al. (2020) indicated, who did not obtain a significant difference in the average feed consumption when adding basil seed powder to a broiler diet during the summer. The addition of different levels of basil seed powder also improved feed consumption under heat stress conditions. This may be due to the components it contains such as linalool, estragol and eugenol, which are antimicrobial compounds that sterilize the bird's digestive system and improve its internal environment, and then increase the utilization of nutrients, which is reflected in the improvement of feed use (Ravid et al., 1997) and it may be due to basil seeds containing many essential oils (Carvacrol, Thymol, Anethole, and Euogenol), which stimulate the bird's appetite and digestion process and thus improve feed intake (Cabuk et al., 2006)

Table 4. Effect of adding basil seed powder (Ocimum basilicum L.) and vitamin C to reducing heat stress and its effect on the average of feed consumed in g / bird for weeks of experiment

Treatments	Mean ± Standard error (g)					
	first week	second week	third week	fourth week	fifth week	Total feed consumption average
T1	121.70 b 4.53±	70332. c .80±4	621.56 b 1.61±	841.07 b 8.69±	889.97 ab 3.18±	2807.13 c 16.88±
T2	127.63 b 5.66±	80379. a 8.91±	628.63 ab 3.21±	873.33 a 8.47±	916.97 a 4.63±	2919.97 a 6.35±
T3	120.96 b 0.62±	30362. ab 5.86±	642.40 a 3.36±	876.63 a 4.82±	882.73 ab 8.02±	2885.17 ab 0.92±
T4	117.46 b 0.50±	30341. bc 5.66±	622.06 b 4.04±	840.97 b 13.44±	905.73 ab 22.25±	2827.63 bc 33.14±
T5	142.00 a 2.59±	00352. bc 13.07±	621.90 b 10.20±	870.23 ab 9.34±	869.30 b 4.11±	2855.73 abc 23.62±
The level of significance	**	*	*	*	*	*

The feed conversion ratio

The values of the food conversion ratio depend directly on the average feed consumption and the utilization of it and thus the weight gain of the bird and its conversion into the meat.

Through these traits, the value of the economic indicator is determined for any production project, in addition to being an indication of the extent to which the food provided to the bird is utilized during a breeding time. The results in (Table 5) There were no significant differences in the values of the feed conversion ratio for weeks 1, 2, 3, 4 and 5 of the chicks' age. As for the total feed conversion ratio, the results indicated that treatment T3 birds excelled and gave the lowest value, which amounted to 1.533 (gm feed / g weight gain)significant deteriorated, It also did not differ significantly with the treatment T3 with the treatments T1, T4 and T5, while the treatments T1, T2, T4 and T5 did not differ significantly between them. The effect of levels of basil seed powder, vitamin C, and their mixture, which were added to the diet, showed a significant trait.This is what was shown by the results of the same table in the total food conversion ratio, recording significant differences at the ($P < 0.05$) probability level for treatment T3, which recorded the lowest average for this trait, which was 1.533 (kg of feed / kg weight).While treatment T2 recorded the highest value for this trait, which was 1.599 (kg of feed / kg weight).The results were not in agreement with Chitra (2020), who obtained a significant improvement in the total feed conversion ratio of thermally stressed broilers when adding basil seed powder at a concentration of 1%.

Table 5. Effect of adding basil seed powder (Ocimum basilicum L.) and vitamin C to reducing heat stress and its effect on feed conversion ratio g feed / g weight gain for weeks of the experiment

Treatments	Mean ± Standard error (gm)					
	first week	second week	third week	fourth week	fifth week	Total feed conversion ratio
T1	1.021 0.073±	1.185 0.044±	1.532 0.034±	1.633 0.019±	1.885 0.117±	1.555 ab 0.011±
T2	1.032 0.142±	1.373 0.066±	1.562 0.044±	1.635 0.028±	1.835 0.073±	1.591 a 0.021±
T3	0.988 0.133±	1.275 0.066±	1.528 0.044±	1.588 0.078±	1.780 0.067±	1.533 b 0.014±
T4	0.921 0.044±	1.216 0.072±	1.585 0.023±	1.629 0.045±	1.858 0.054±	1.564 ab 0.006±
T5	1.151 0.117±	1.278 0.123±	1.507 0.143±	1.643 0.023±	1.740 0.035±	1.544 ab 0.014±
The level of significance	*N.S*	*N.S*	*N.S*	*N.S*	*N.S*	*

We conclude from our current study that adding the basil seed powder to the bush significantly improved the productive traits of broilers and this improvement increased with the increase in the added concentration, especially at the fourth and fifth weeks of age and the cumulative weight increase, This confirms the role of medicinal plants in improving the productive performance of broilers.

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