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ORIGINAL ARTICLE

Efficiency of Cordia MYXA (Bumber) Fruit Powder added to Broiler Diets Exposed to Heat Stress on Productive and Physiological Performance

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ABSTRACT

As a scientific attempt to find food alternatives that contribute to alleviating the heat stress that birds are exposed to, this study resorted to showing the effect of using different levels of Bumber fruit powder to the diets of broilers exposed to heat stress, 240 one-day-old broilers of Ross 308 breed, bred in One of the fields belonging to broiler breeders in the district of Jableh, 65 km north of the center of Babil Governorate (Babylon city), Iraq. The birds were randomly distributed to four treatments, each treatment 60 birds and three replicates for each treatment (20 birds per replicate), the experiment transactions were divided into: Control treatment (C) without Any addition, the first treatment (B1) was added to its diet Bumber fruits powder at an amount of 2 g/kg of feed, the second treatment (B2) was added to its diet by Bumber fruits powder at an amount of 3 g/kg of fodder, and the third treatment (B3) was added to its diet by Bumber fruits powder at an amount of 4 g/kg of feed, during the six-week trial period, the productive characteristics of (body weight, weight gain, feed consumption, food conversion factor) were studied, which were studied weekly starting from the age of one day, in addition to the characteristics of blood plasma represented by (total glucose, cholesterol For total, total protein, liver enzymes (AST, ALT, ALP, HDL, LDL, VLDL) which were studied at the age of three and six weeks during the study period, the results of the current study indicated a significant improvement in the productive performance of diseased broilers to intermittent heat stress represented by weight gain. Body weight, feed consumption rate and food conversion factor, as well as the moral improvement in blood plasma characteristics represented in blood chemical characteristics and liver enzymes activity, in addition to a decrease in harmful fat levels in blood plasma.

We conclude from the current study that adding Bumber fruit powder to broiler diets exposed to heat stress has significantly improved the productive and physiological performance of the bird, which may give the impression that adding this substance may add a significant difference in the general performance of the bird, which is positively reflected on the general health status of the bird..

Keywords: Broiler, Bumber, Heat Stress, Productive Performance, Physiological Performance

INTRODUCTION

Poultry farming is an industry that has importance and influence in the national economy and plays a key role in securing animal protein from meat and eggs of high nutritional value and at acceptable prices when compared to the prices of meat and other animal derivatives. This industry has faced many obstacles, especially in light of the remarkable progress in the development of technologies. In addition, the excessive use of food additives and alternatives of chemical origin, which are added to rations in order to improve growth and bird resistance to diseases, has a high-risk negative effect after its collection with the tissues and organs of birds suitable for human consumption, especially since one of the main causes that leads to the deterioration of The productive state of the bird is its exposure to Heat Stress, which is one of the most important causes that inflict very dangerous economic losses to the poultry industry due to the deterioration that affects production, growth and the bird's immunity (Mujahid et al., 2007), as stress works on the formation of free radicals of effective oxygen species. ROS (Reactive oxygen species), which cause oxidative damage to cells through the occurrence of oil peroxidation (Mohammed, 2013; Altan et al. 2003; Mujahid et al., 2007), so many studies aimed at knowing the mechanisms and pathways caused by stress and ways to reduce or reduce it, while other researchers went to nutritional treatments aimed at alleviating stress, including food additives, and one of these additions is the Bumber fruit, scientific name Cordia myxa, this plant originates in the continent of Asia in the southeast of it in addition to the region extending from the eastern Mediterranean to eastern India. The apricot fruit has a smooth texture and a sticky, mucous-sweet taste inside (Oudhia, 2007). The chemical components of the plant are oils, glycosides, flavonoids, sterols, saponins, terpenoids, alkaloids, phenolic acids, fatty acids, coumarins, resins, and mucilage. The pharmacological effects are limited. The plant is anti-inflammatory, immune stimulating, analgesic, and bronchodilator, widely used for fumigation for people with shortness of breath, protective effect on the heart, blood vessels and system. Respiratory (USDA, 2015), and due to the lack of a detailed study of the fruit of this plant on domestic birds, this study aimed to evaluate its effectiveness on the productive and physiological performance of birds exposed to heat stress.

MATERIALS AND METHODS

This study was conducted in one of the broiler breeders' fields in Jableh District for the period from 5/4/2021 to 1/6/2021 to investigate the effect of adding Bumber fruit powder to the diets of heat-stressed broilers, and the division of the experiment parameters was as follows:

1 Control treatment (C)/ fed on basic diet without any addition.
2 The first treatment (B1)/ was fed on a ration to which 2 g/kg diet was added from the bamber fruit powder.
3 The second treatment (B2)/ was fed on a ration to which 3 g/kg diet of Bumber fruit powder was added.
4 The third treatment (B3)/fed on a diet supplemented with 4g/kg diet of amber fruit powder.

And Table (1) shows the composition of the feed used for the experiment.

Table 1: The composition of the feed used for the experiment

Feed material	Starter diet 1 day - 3 week	Final diet 4-6 weeks
Yellow corn	43	45
Wheat	17.5	17.5
Soybean meal	26.5	23
Protein concentrate*	10	10
Table salt	0.4	0.4
Limestone	0.4	0.4
Vegetable oil	2.0	3.5
Lysine	0.1	0.1
Methionine	0.1	0.1
Total	100	100
chemical analysis**		
Crude protein %	22.27	20.87
Representative energy (kilo calories/kg of feed)	2984.05	3103.6
Crude protein/energy ratio	133.99	148.71
Lysine %	1.23	1.14
Methionine + cysteine	0.84	0.80
Calcium%	1.03	1.02
Vital phosphorous	0.47	0.46
Raw fiber%	5.17	4.96

* Produced by the company (Profemi) Jordan origin. Food ingredients: energy represented, kilocalories/kg 2200, crude protein 45%, crude fiber 5.3%, crude fat 6%. 3% available phosphorous%, 2.75% lysine, 2.30% cysteine + methionine, 1.8% methionine, 2.5 ramada

** The chemical composition of the rations calculated according to the NRC (1994).

All birds were exposed to heat stress at intermittent intervals for 30 minutes / 6 times a day. The temperature inside the hall was measured by three thermometers distributed at the beginning, middle and end of the hall. The temperatures were recorded daily three times at eight in the morning, twelve in the afternoon and eight in the evening. Fruit powder was added. The pumper is added to the rations in the prescribed proportions and mixed for each treatment separately with a quantity of feed to ensure homogeneity and then added to the remaining quantities to be mixed and presented to the birds. This process takes place every 7 days to ensure that the powder is not damaged. The productive characteristics were studied weekly and according to the equations mentioned by Al-Fayyad and Naji (1989) as follows:

1. Body weight of the bird: Chicks were weighed separately at the end of each week.
2. Weight gain: the weight of the birds for one repeater at the end of the week - the weight of the birds for the repeater at the beginning of the week.
3. Feed consumed: the amount of feed provided at the beginning of the week - the amount of feed remaining at the end of the week
4. Feed conversion factor: weekly feed intake/weight gain.

The biochemical characteristics, they were studied at the third and sixth week of life of the birds. Blood was collected from birds at a rate of 3 birds per replicate / 9 birds per treatment and kept in anticoagulant tubes and then transferred to the DNA Research Center / University of Babylon, for the purpose of plasma separation and conducting the necessary tests according to the instructions Included with the test kit. The data of this study were analyzed according to a Complete Randomized Design (CRD), to study the effect of different treatments on the studied traits, and the significant differences between the means were compared with Duncan (1955) polynomial test, and the ready-made statistical program SAS (2012) was used in the statistical analysis.

RESULTS

The result showed that the Table. (1) Indicated the effect of adding Bumber fruit powder to the diets of broiler chicken exposed to heat stress on the live body weight during the different breeding periods. It is noted from the table and during the first, second and third periods that the addition treatment recorded a highly significantly (P≤ 0.01) when compared with the control treatment, while during the fourth period, the fourth and third treatments recorded highly significantly (P≤0.01) compared to the second addition treatment and the control treatment, while the fourth addition treatment recorded a significant (P≤0.05) compared to the control treatment only. During the fifth period, the second and third treatments did not record any significant difference between them and the control treatment as well for the fifth period.

Table 1: The effect of adding different levels of Cordia myxa (Bumber) to diets of broiler check on the body weight (mean ± standard error).

Tretment	Study period				
	1	2	3	4	5
C	143.22±0.61 D	342.44±1.38 D	719.65±4.80 D	1241.86±1.63 C	1845.78±15.60 B
B1	147.48±1.13 C	346.79±0.92 C	734.32±2.99 C	1251.42±3.17 C	1848.16±1.62 AB
B2	155.53±1.33 B	352.42±1.49 B	749.98±3.21 B	1267.32±4.46 B	1869.66±7.29 AB
B3	164.89±0.63 A	360.35±1.16 A	768.17±1.76 A	1301.13±4.93 A	1878.09±6.27 A
Significant level	0.01	0.01	0.01	0.01	0.05

*The numbers from 1-5 refer to the weeks of the experiment, and each number refers to a whole week. The different letters within the same column indicate the presence of significant differences between the experiment treatments when comparing the means and at the level of significance (P≤0.05) and (P≤0.01). *Letters/ C: control treatment without any addition, B1: the first treatment added to its ration 2 gm of amber fruit powder per kg of feed, B2 the second treatment 3 gm of amber fruit powder was added to its diet per kg of feed, B3 the third treatment 4 gm of powder was added to its ration Albamber fruit

Per kg of feed: The result showed in the Table (2) indicated the effect of adding bumber fruit powder to the diet of broiler chicken exposed to heat stress on the body weight gain during the different breeding periods, as it is noted from the table during the first and third periods that the treatment were highly significant (P≤0.01) compared to the control treatment, while the control treatment and the first addition treatment recorded a significant (P≤0.05) superiority in the rate of weight gain when compared with the fourth addition treatment and for the second week only, while during the fourth week the addition treatment (B3) recorded a significant superiority over the two addition treatments (B2 and B1) while no superiority was recorded over the control treatment (C).

Table 2: The effect of adding different levels of Cordia myxa (Bumber) to diets of broiler check on the body weight gain (mean ± standard error).

Treatment	Study period				
	1	2	3	4	5
C	102.22±0.61D	199.22±1.23 A	377.21±3.91 D	522.20±3.98 AB	603.92±14.11A
B1	106.48±1.13C	199.30±0.75 A	387.53±2.25 C	517.10±2.05 B	596.73±1.63 A
B2	114.52±1.33B	196.90±0.25 AB	397.55±1.80 B	517.33±3.69 B	602.34±7.16 A
B3	123.89±0.63A	195.46±1.15 AB	407.81±2.52 A	532.95±4.13 A	576.96±11.05A
Significant level	0.01	0.05	0.01	0.05	N.S

*The numbers from 1-5 refer to the weeks of the experiment, and each number refers to a whole week. The different letters within the same column indicate the presence of significant differences between the experiment treatments when comparing the means and at the level of significance (P≤0.05) and (P≤0.01). *Letters/ C: control treatment without any addition, B1: the first treatment added to its ration 2 gm of amber fruit powder per kg of feed, B2 the second treatment 3 gm of amber fruit powder was added to its diet per kg of feed, B3 the third treatment 4 gm of powder was added to its ration Albamber fruit per kg of feed.

Table 3: The effect of adding different levels of Cordia myxa (Bumber) to diets of broiler check on the feed consumption (mean ± standard error).

Treatment	Study period				
	1	2	3	4	5
C	149.17±2.09C	317.56±3.78 B	651.79±4.43 C	806.83±3.34 C	920.09±4.97 B
B1	157.32±1.60AB	354.34±1.80 A	660.04±2.59 C	830.15±4.98BC	927.76±1.44 B
B2	161.70±1.92A	356.33±2.21 A	696.48±14.66B	843.60±3.20AB	939.23±3.17 A
B3	155.20±0.75B	354.60±2.58 A	728.76±6.36 A	872.71±18.72A	950.38±2.38 A
Significant level	0.01	0.01	0.01	0.05	0.01

Table (3) showed that the effect of adding bumber fruit powder to the diets of heat-stressed broilers on the rate of feed consumption, as it is noticed from the table during the first week

that the addition treatment B2 achieved a highly significant superiority (P≤0.01) in the rate of feed consumption compared to the treatment of addition B3 and the treatment of Control C, in the second week it was observed that B2 treatments followed by B3 and B1 were highly significant (P≤0.01) compared to control treatment C, while in the third, fourth and fifth weeks, B3 and B2 supplementation treatments recorded a significant superiority over B1 supplementation and control treatment.

*The numbers from 1-5 refer to the weeks of the experiment, and each number refers to a whole week. The different letters within the same column indicate the presence of significant differences between the experiment treatments when comparing the means and at the level of significance (P≤0.05) and (P≤0.01). *Letters/ C: control treatment without any addition, B1: the first treatment added to its ration 2 gm of amber fruit powder per kg of feed, B2 the second treatment 3 gm of amber fruit powder was added to its diet per kg of feed, B3 the third treatment 4 gm of powder was added to its ration Albamber fruit per kg of feed.

Table 4: The effect of adding different levels of Cordia myxa (Bumber) to diets of broiler check on the feed conversion ratio (mean ± standard error).

Treatment	Study period				
	1	2	3	4	5
C	1.45±0.02 AB	1.59±0.01 B	1.72±0.01 B	1.54±0.01 B	1.52±0.02 B
B1	1.47±0.02 A	1.77±0.09 A	1.70±0.05 B	1.60±0.03 AB	1.55±0.02 B
B2	1.41±0.05 B	1.80±0.01 A	1.75±0.02 AB	1.63±0.01 A	1.55±0.01 B
B3	1.25±0.08 C	1.81±0.01 A	1.78±0.02 A	1.63±0.04 A	1.64±0.02 A
Significant level	0.01	0.01	0.01	0.05	0.01

Table (4) showed that the effect of adding bumber fruit powder to the diets of heat-stressed broilers on the feed conversion ratio, in the first period as the B3 treatment recorded a highly significant (P≤0.01) decrease in the feed conversion ratio compared to all treatments of the experiment, while in the second and fourth weeks, a treatment was recorded Control C decreased in the conversion ratio when compared with the addition treatments, while the addition treatment B2 and the addition treatment B1 recorded a significant decrease in the feed conversion ratio compared to the rest of the experimental treatments for the third and fifth weeks.

*The numbers from 1-5 refer to the weeks of the experiment, and each number refers to a whole week. The different letters within the same column indicate the presence of significant differences between the experiment treatments when comparing the means and at the level of significance (P≤0.05) and (P≤0.01). *Letters/ C: control treatment without any addition, B1: the first treatment added to its ration 2 gm of amber fruit powder per kg of feed, B2 the second treatment 3 gm of amber fruit powder was added to its diet per kg of feed, B3 the third treatment 4 gm of powder was added to its ration Albamber fruit per kg of feed.

The results shown in Table No. (5) indicate the effect of adding bumber fruit powder to the diets of broilers exposed to heat stress on the biochemical blood characteristics, as it is noted that the treatment did not have a significant effect on glucose level during the third week of life of the broiler, while the two treatments were recorded B3 and B2 were significantly superior (P≤0.05) over treatments B1 and control treatment C during the fifth week of broiler life. As for cholesterol levels, treatments B3 and B2 achieved a significant (P≤0.05) superiority (P≤0.05) over the rest of the experimental treatments and for the third and fifth weeks of broiler age, Regarding protein levels, treatment B3 achieved highly significant superiority (P≤0.01) during the third week, while treatment B1 recorded highly significant superiority (P≤0.01) over the rest of the experimental treatments during the fifth week.

Table **5**: The effect of adding different levels of Cordia myxa (Bumber) to diets of broiler check on the blood biochemical (mean ± standard error).

Treatment	Study period					
	Glucose 1	Glucose 2	Cholesterol 1	Cholesterol2	Protein 1	Protein 2
C	245.33±7.21 A	213.00±5.50 B	135.33±12.01B	159.33±2.96B	3.36±0.08C	5.30±0.26 B
B1	244.33±8.45 A	231.00±11.93B	152.66±0.88 B	162.66±8.25B	3.70±0.25C	6.43±0.14 A
B2	255.33±4.91 A	265.33±9.83 A	162.00±3.05 A	152.66±7.05B	4.56±0.28B	5.63±0.12 B
B3	250.66±5.04 A	285.00±13.11 A	171.33±8.76 A	184.33±0.88A	5.80±0.05A	5.73±0.21 B
Significant level	N.S	0.05	0.05	0.05	0.01	0.01

Table 6: The effect of adding different levels of Cordia myxa (Bumber) to diets of broiler check on the liver enzyme (mean ± standard error).

Treatment	Study period					
	AST 1	AST 2	ALT 1	ALT 2	ALP 1	ALP 2
C	40.36±3.64 A	53.97±1.26 A	14.93±1.59 A	17.35±0.17A	84.33±1.85B	96.00±2.64A
B1	38.72±2.48 A	53.79±1.86 A	15.45±0.17 A	16.11±0.52A	93.00±1.15A	96.33±1.45A
B2	33.27±1.84 A	41.23±4.00 B	8.26±1.42 B	12.36±0.50B	91.33±2.02A	97.33±2.33A
B3	33.83±0.65 A	35.22±2.66 B	10.53±0.83 B	9.92±1.05 C	93.00±2.08A	98.00±0.57A
Significant level	N.S	0.05	0.05	0.05	0.01	N.S

Table 7: The effect of adding different levels of Cordia myxa (Bumber) to diets of broiler check on the HDL, LDL, VLDL (mean ± standard error).

Treatment	Study period					
	HDL 1	HDL 2	LDL 1	LDL 2	VLDL 1	VLDL 2
C	38.66±1.45 C	47.04±4.08 B	49.33±3.58 A	52.99±2.58 A	50.66±9.49 A	59.29±4.62 A
B1	49.20±3.23 BC	52.65±6.29 B	49.66±2.93 A	61.46±2.73 A	55.15±0.62 A	48.55±8.32 A
B2	59.04±6.02 AB	55.00±6.08 B	52.80±5.04 A	52.75±4.36 A	50.92±6.01 A	44.91±2.49 A
B3	65.22±0.83 A	79.61±2.36 A	57.09±6.70 A	58.33±7.33 A	49.01±2.71 A	43.72±0.83 A
Significant level	0.01	0.01	N.S	N.S	N.S	N.S

*The numbers 1 and 2 refer to the third and fifth weeks of the bird's life, and each number refers to a whole week. The different letters within the same column indicate the presence of significant differences between the experiment treatments when comparing the means and at the level of significance (P≤0.05) and (P≤0.01). *Letters/ C: control treatment without any addition, B1: the first treatment added to its ration 2 gm of amber fruit powder per kg of feed, B2 the second treatment 3 gm of amber fruit powder was added to its diet per kg of feed, B3 the third treatment 4 gm of powder was added to its ration Albamber fruit per kg of feed.

The results showed in Table (6) indicate the effect of adding the bumber fruit to the diets of heat-stressed broilers on the activity of liver enzymes, as no superiority was observed in the activity of AST enzyme for the third week of bird life, while the addition treatments B3 and B2 recorded a significant decrease in the activity of this The enzyme activity for the fifth week, as for the ALT enzyme activity, the addition treatments B3 and B2 recorded a significant decrease for the third and fifth weeks of bird life, while the addition treatments recorded a highly significant superiority of the ALP enzyme activity for the third week only when compared with the control treatment C.

*The numbers 1 and 2 refer to the third and fifth weeks of the bird's life, and each number refers to a whole week. The different letters within the same column indicate the presence of significant differences between the experiment treatments when comparing the means and at the level of significance (P≤0.05) and (P≤0.01). *Letters/ C: control treatment without any addition, B1: the first treatment added to its ration 2 gm of amber fruit powder per kg of feed, B2 the second treatment 3 gm of amber fruit powder was added to its diet per kg of feed, B3 the third treatment 4 gm of powder was added to its ration Albamber fruit per kg of feed.

The results shown in Table No. 7 refer to the effect of supplementation on HDL, LDL and VLDL levels, as it is noted that the treatment had a highly significant effect on HDL levels for the third and fifth weeks, while it had no significant effect on LDL and VLDL levels.

*The numbers 1 and 2 refer to the third and fifth weeks of the bird's life, and each number refers to a whole week. The different letters within the same column indicate the presence of significant differences between the experiment treatments when comparing the means and at the level of significance (P≤0.05) and (P≤0.01). *Letters/ C: control treatment without any addition, B1: the first treatment added to its ration 2 gm of amber fruit powder per kg of feed, B2 the second treatment 3 gm of amber fruit powder was added to its diet per kg of feed, B3 the third treatment 4 gm of powder was added to its ration Albamber fruit per kg of feed.

DISCUSSION

Modern scientific studies have resorted to the use of medicinal plants and their products for treatment and using them naturally without any treatment, as they are considered an important source of many secondary (effective) materials that are used as treatment, if we refer to a case that in the case of using manufactured materials it has a negative impact on the consumer, especially after Its accumulation in body tissues, so the reason for the improvement in the productive and physiological performance of heat-stressed broilers under the current study may be attributed to the fact that the Bumber fruit contains many biologically active substances such as glycosides, flavonoids, sterols, phenolic acids, alkalis and coumarins, which have high efficacy against pathogens. Pathological (Orhan, 2015), and this is reflected in its positive effect on broiler birds added to their diets, the fruit of the Bumber, due to the clear improvement in most of the indicators of the study, especially since the birds are heat-stressed, which affects their breathing process. Oudhi (2007) and Al-Awadi and his group (2001) indicated that the therapeutic properties of the pamper fruit lie in its high content of biological active substances found in the fruit such as flavonoids, glycosides and fatty acids, especially oleic, linoleic and palmitic, as well as the high beta-sitosterol, these substances may be attributed The reason for the improvement in the birds during the experimental period compared to the control treatment under study, while Ranjbar et al. (2013) confirmed in a study conducted to investigate whether there was a protective effect of the Bumber fruit in mice treated with tramadol and formalin. Glutathione SOD and total antioxidants, the reason for which the result of the aforementioned study is attributed to the antioxidant properties possessed by the elderberry fruit, as confirmed by Ficarra et al. (1995) to the similarity of the analgesic effect between mefenamic acid and the elderberry fruit, while the moral improvement observed in the results of the study Current production characteristics such as average body weight, weight gain, feed consumption rate and feed conversion factor, always m It is associated with the observed improvement in the general health of the bird, as the latter is reflected in its positive effect on the aforementioned traits. Therefore, the Bumber fruit is considered an important nutritional supplement due to its high content of crude protein, carbohydrates and fibers, in addition to its high representative energy content (Afzal et al., 2004; Ali and Deokule, 2009), The reduction of heat stress observed on experimental birds through the traits under study may reflect positively the content of the natural antioxidants of the bamboo fruit, which usually reduce the activity of liver enzymes ALT and AST, which leads to a reduction in oxidative stress and damage to cells associated with enhancing the activity of glutathione enzyme. Peroxidase and SOD (Dani et, al., 2008), The positive effects obtained from the results of previous studies conducted on mice support, in particular, the results of the current study, especially after exposing birds to periods of heat stress, which supports our previous belief before starting the research that this fruit has a protective effect and this has been proven on the productive and physiological levels. Therefore, the current study recommends the possibility of adding dried Bumber shoot powder with concentrations of 3 and 4 g/kg of feed to broiler diets to support the health status of the bird and to alleviate heat stress.

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