تأثير الكركم و/أو الكمون على الكفاءة الإنتاجية وحالة الأكسدة في دجاج اللحم

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الملخص:

أجريت هذه التجربة لدراسة تأثير إضافة كل من الكركم و/أو الكمون على الكفاءة الإنتاجية وبعض مكونات مصل الدم وحالة الأكسدة ومواصفات الذبيحة وكذلك بعض التغيرات النسيجية الشكلية فى الأمعاء عند السلالة من دجاج اللحم. فقد استخدم (240) صوص دجاج اللحم (كوب 500) بعمر يوم واحد وزعت عشوائيا الى 4 مجموعات. هذا وقد كان النظام الغذائي المتبع كالآتي: المجموعة الأولى (G1) غذيت بالخلطة الأساسية فقط، المجموعة الثانية (G2) غذيت بنفس الخلطة مع استخدام مسحوق الكمون ، والمجموعة الثالثة (G3) غذيت بنفس الخلطة الأساسية مع استخدام مسحوق الكركم بمعدل ، وتم تغذية المجموعة الرابعة (G4) بنفس الخلطة الأساسية مع استخدام مسحوق الكمون ومسحوق الكركم معاً.

تم تجميع عينات الدم بشكل فردي من خمسة طيور من كل تكرار في نهاية التجربة، وتم فصل مصل الدم بها وحفظها واستخدامها لاحقاً لمعايرة بعض مكونات مصل الدم، وأيضا تم جمع عينات من الأنسجة الكبدية لدراسة مؤشرات الإجهاد التأكسدي تم تحديد مستوى كلٍّ من إنزيمات الجلوتاثيون المختزل (GSH) والمانونالدهيد (Malondialdehyde MDA)، الجلوتاثيون بيروكسيديز (GPx)، وبعد ذبح الطيور درست مواصفات الذبيحة.

وأظهرت النتائج ما يلي وجود فروق معنوية إيجابية على معدلات النمو وكفاءة استخدام الغذاء لصيصان المجموعات التي غذيت بمسحوق الكمون ومسحوق الكركم، دون تغيرات معنوية في كل من البروتين الكلي والألبيومين والجلوبيولين ومستوى خمائر AST,ALT واليوريا والكيرياتينين، مع ارتفاع في مستوى كل من إنزيمات الجلوتاثيون بيروكسيديز وانخفاض مستوى انزيم المانونالدهيد. مع وجود فروق معنوية إيجابية في مواصفات الذبيحة.

وقد خلصت نتائج هذه الدراسة الى أنه من الممكن استخدام كل من مسحوق الكمون ومسحوق الكركم كإضافات طبيعية لما لها من تأثير فعال وايجابي ليس فقط على معدلات النمو ومواصفات الذبيحة ولكن أيضا للحد من حالات الإجهاد التأكسدي التي قد تحدث في الدجاج .

الكلمات المفتاحية: مسحوق الكركم – مسحوق الكمون – دجاج اللحم – الإجهاد التأكسدي – مواصفات الذبيحة.

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Impact of Turmeric (Curcuma longa) and/or Cumin (Cyminum cyminum) on performance and oxidation status of broiler chickens

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Abstract:

An experimental feeding trial was conducted to visualize the impact of dietary Turmeric *(Curcuma longa)* and/or Cumin *(Cyminum cyminum)* fortification at a rate of 3 Kg/ton in broiler diets on growth performance. Consequently, total of (240) one-day old chicks (Cobb 500) was randomly assigned into 4 equal groups each of three replicates. The first group was fed on corn- soya bean based basal diets (starter- grower- finisher) covering the nutrient requirements according to the recommendation of the breed manual without any supplementation and served as control group (G1). The second group (G2) was fed on the basal diets fortified with Cumin powder. The third group (G3) was fed on the basal diets and fortified with Turmeric powder at the same inclusion rate. Meanwhile the diets of the fourth group (G4) were fortified with both additives at the same inclusion rate for each additive. The results revealed significant ($P < 0.05$) positive effects of Turmeric and Cumin addition either separately or combined together (G2, G3 and G4) on most of growth performance traits. None of the examined serum parameters seemed to be affected by different dietary fortification. The highest (GSH), (GPx) and superoxide dismutase and lowest significant (MDA) levels were observed in the bird supplemented with turmeric and/or cumin in comparison to the control group, a situation that indicated a positive impact of both additives either added alone or in combination on antioxidant defense mechanisms. Results also indicated significant positive effects on most of carcass traits. In addition, histo-morphological picture showed normal histo-morphological structure without any histo-pathological alteration of the hepatocytes. It could be concluded that the use of both Turmeric and/or Cumin either alone or in combination at the aforementioned levels and route of administration had positive effects on growth performance, carcass traits, and antioxidant status of broiler chickens, although they didn't affect serum biomarkers and gut morphology a situation.

Keywords: Antioxidants, broiler, carcass traits, Cumin powder, serum parameters, Turmeric powder, Performance.

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1-Introduction

The principle of poultry production is to achieve high level of performance through efficient utilization of feed keeping survivability as maximum as possible. Feed additives are products used in animal and poultry nutrition for purposes of improving quality of feeds and to improve their performance and health. The risk of bacteria becoming resistant to specific antibiotics and the residual effects of using antibiotic growth promoters (AGP) in poultry feed led to antibiotic banning as growth promoters in animal production by European Union since January 2006 ***Cross et al.*** **(2007)**. With the removal of AGP from poultry diets and also increased concerns about food safety, general health risks and environmental contamination, the search for growth-promoting alternatives is necessary ***Houshmand et al.,*** **(2011)**. Many of researches have been done in the last three decades to optimize nutrient requirements, finding the alternatives feed resources and finding out the alternative and safe feed additives. Phytogenic products have been used as food spices and a traditional remedy for many centuries, but their application in animal and poultry feed industry is almost new. Phytogenic products have received more interest to be used as feed additives after the ban on antibiotic growth promoters in animal feed industry by European Union in 2006, ***Cross et al.*** **(2007)**. In recent years, particular attention has been paid on the use of probiotics, prebiotics, and herbs and spices products as natural alternatives for AGP. Natural products from herbs and spices have been reportedly used as feed additives for several farm animals ***Khan et al.,*** **(2012)**. Their inherent advantages as compared with synthetic antibiotics or inorganic chemicals are that they are natural, less toxic and residue free. These characteristics have rightly positioned them to be ideal feed additives in animal production ***Wang et al.*****, (1998)**. Phytogenic feed additives are natural products originated from different parts of the plants, mostly in the form of powder or extracts. Conducted for this products; and most of these effects has been attributed to the plants intermediatory metabolites such as alkaloids, phenolic and polyphenolic compounds, terpenoids, saponins, and flavonoids ***Windisch et al.*** **(2008)**. Beneficial effects of bioactive plant substances in animal and poultry nutrition may include the stimulation of appetite and feed intake, the improvement of endogenous digestive enzyme secretion, activation of immune responses and antibacterial, antiviral and antioxidant actions ***Toghyani et al.*** **(2010)**.

Turmeric *(Curcuma longa)* is a tropical plant is considered one of the important phytogenic additives. Turmeric and its extracts have been reported to be an effective alternative to AGP's in poultry production ***Bask,*** **(2015)**. Curcumin has been shown to have several biological effects, exhibiting anti-inflammatory ***Holt et al.*** **(2005),** antioxidant ***Iqbal et al.*** **(2003)** and

hypolipidaemic ***Ramirez-Tortosa et al.,*** **(1999)** activities. Curcumin has also been studied extensively as a chemo preventive agent in several cancers ***Duvoix et al.,*** **(2005)**. Additionally, ithasbeen suggested that Curcumin possess hepatoprotective, antitumor, antiviral and anticancer activity ***Polasa et al.,*** **(1991)**. It is used in gastrointestinal and respiratory disorders ***Anwarul et al., (2006).*** It has been reported that turmeric supplemented at 1.0 g/kg diet improved growth performance of broiler chickens ***Kumari et al.,*** **(2007)**. In another study, 0.75% and 1% inclusion of turmeric in the diets of broiler chickens were recorded to bring about an improved body weight gain, feed intake and feed conversion ratio ***Al- Kassie et al.*** **(2011)**. ***Nanung*** **(2013)** reported that dietary supplementation of poultry diets with turmeric may have beneficial effects on the carcass traits of broiler chickens as it contains beneficial phytochemicals, like curcumin, ar-turmerone, methylcurcumin, and other active compounds. ***Wang et al.*** **(2015)** also documented that dietary turmeric supplementation at 100 – 300 mg/kg diet significantly increased the breast muscle weight and breast muscle weight ratio($P<0.05$),but significantly reduced abdominal fat ratio ($P<0.05$) as compared to the control group. They further explained the decrease in abdominal fat might be due to the influence of curcumin on adipocyte apoptosis or glucose withdrawn from blood as by ***Sugiharto et al.*** **(2011)**.

On the Other hand Cumin plant ***(Cyminum cyminum)*** is considered as aromatic herb or spices of nutritional and medical properties. Scientific information from American Ministry of Agriculture has shown that cumin contains most dietary nutrients such as carbohydrates, fat of both saturated and unsaturated fatty acids, proteins. Moreover minerals, vitamins and water. ***Dorman and Deans*** **(2000)**, ***Friedman et al.*** **(2004)**, **Sema et al. (2007)** ***and Jazani et al.*** **(2008)** have indicated the antimicrobial activity of cumin and the possibility of its potential use of its essential oil for the control of many diseases conditions. Nutritionally, inclusion the broiler diets with cumin seed meal induces an increase in the relative weight of the crop. An improvement in the absorption process as a result of increasing diet fibers was also noticed ***Mansoori et al.*****, (2006)**. *Other researchers proved an increase in body weight , feed conversion ratio; with decreasing in Hematological values when using 2% of cumin in broiler diets* ***Ibrahim et al.(2007).*** *In addition* ***De M et al.*** **(2003)** *,* ***Al-Snafi*** **(2016)** **and** ***Patil et al.*** **(2017)** *cited that cumin showed wide range of pharmacological activities inclu*ding antimicrobial, antioxidant, anticancer, hypolipidemic, cardiovascular, central nervous, respiratory, immunological, anti-inflammatory, analgesic antipyretic and many other pharmacological effectsThey added that Phytochemical analysis showed that Cuminum cyminum contained:

alkaloid , coumarin, anthraquinone, flavonoid, glycoside, protein, resin, saponin, tannin and steroid.

2- AIM OF WORK:

As mentioned above it has become very clear that there is a quite bite of benefits of both Turmeric and cumin as a medical and nutritional resource to be used for poultry. This study therefore had came out from the understanding that these medical plants can improve the performance of broiler chicks under our Egyptian environmental conditions. However the literature is not rich dealing with the subject and we think that further studies are required to quantify and characterize the parameters that involved this field. This study is a trial along this direction and conducted to visualize the impact of dietary turmeric *(Curcuma longa)* and/or cumin *(Cuminum cyminum)* (in a powder form) fortification at a rate of 3 Kg/ton in broiler diets on their growth performance, selected serum parameters, oxidation stress biomarkers, carcass traits as well as the related histo-morphological picture of some internal organs of Cobb ^{500} broiler chick breed so as to offer the experiment results to nutritionists and chicken farmers as a reference.

3- MATERIAL AND METHODS

This experimental work was carried out at the research unit of Nutrition and Clinical Nutrition Department at Faculty of Veterinary Medicine Cairo University Giza Egypt, and was conducted to investigate the impact of dietary Turmeric ***(Curcuma longa)*** and/or Cumin ***(Cuminum cyminum)*** (in a powder form) fortification at a rate of 3 Kg/ton in broiler diets on their growth performance, selected serum parameters, oxidation stress biomarkers, carcass traits as well as the related histo-morphological picture of some internal organs of Cobb 500 broiler breed.

3.1. Birds and husbandry

A total of two hundred forty; one day-old- broiler chicks (Cobb 500) obtained from Pyramid Poultry Company in Giza, were randomly divided into 4 experimental groups with 3 replicates for each group (20 chicks/replicate) and reared in separate pens of an open house system bedded by a layer of wood shaving with a constant lighting program employed during the whole experimental period (five weeks). Chicks were provided with clean plenty drinking water and fed ad-libitum. All birds were kept under standard hygienic conditions and were subjected to prophylactic vaccination and management program against viral and bacterial diseases during the whole experimental period that lasted up to 32 days of age.

3.2. Diets and Experimental Design

Birds in the different experimental groups were fed on 3 phases corn-soybean based basal diets (starter (1-15) d, Grower (16-24) d and finisher (25-38) d. The experimental groups

were as the following: the first group (G1) served as the control group and fed on basal diets only without any supplementations, the second (G2) was fed on the same basal diets supplemented with Cumin *(Cyminum cyminum)* powder at a rate of 3 kg/ton and the third group (G3) was fed on basal diets and supplemented with Turmeric *(Curcuma longa)* powder at a rate of 3 kg/ton. Whereas, the fourth (G4) was fed on basal diets and supplemented with both Cumin *(Cyminum cyminum)* and Turmeric *(Curcuma longa)* were added at a rate of 3 kg/ton each. The experimental corn-soy based basal diets were formulated on the basis of the ideal protein concept (ileum digested A.A.) , to meet the nutrient requirements of (Cobb 500)broiler chicks as recommended by breed manual and having the same amino acid profile. Physical compositions calculated and predicted chemical analysis according to **AOAC, (2005)** are illustrated in (Table 1)

3.3. Measurements, observations and statistical analysis

3.3.1 Growth Performance Parameters

Birds in different experimental groups were weighed at the initial time and then weekly until the termination of the experiment at 38 days of age. Body weight gain, feed intake were recorded and feed conversion ratios for each of group were calculated accordingly.

Results showing the impact of different dietary treatments on growth performance traits of different experimental groups in comparison to the control are shown in table (2)

3.3.2 Serum Parameters

At the end of experiment, blood samples were collected after cervical dislocation of birds (3 birds/ replicate) and sera were separated, refrigerated and subsequently analyzed. Serum biochemical analysis consisted of the quantification of serum albumin ***Doumas et al., (1971)***. Liver function test aspartate aminotransferase (**AST**) and alanine aminotransferase (**ALT**) according to ***Young (1990)***. Kidney function tests urea ***Wybenga et al., (1971)***., uric acid ***Tietz (1990)*** and Creatinine according to ***Henry (1974).*** Using commercial kits SPECTRUM, Germany.

3.3.3 Ant-Oxidant biomarkers :

Liver tissues were collected from all groups at end of experiment (2 samples / replicate were taken) for assessment of reduced glutathione (**re-GSH**) according to method described by ***Beutler et al., (1963)***, glutathione peroxidase (**GPx**) according to the method described by ***Paglia & Valentine (1967)***. Superoxide dismutase (**SOD**) according to procedure described by ***Marklund & Marklund, (1974)*** with some modification of ***Nandi & Chatterjee (1988)*** and Lipid peroxidation "Malondialdehyde" (**MDA**) according to ***Kei, (1978).***

Results of the examined ant-Oxidant biomarkers in different experimental groups are shown in table (4).

3.3.4. Carcass traits:

At 38 days of age after the end of experimental period, 3 birds from each replicate of different experimental groups were randomly chosen, left overnight in the waiting yard where only water was allowed. Each bird was weighted then hanged, slaughtered, scalded at 55-65 C0, defeathered, eviscerated and washed with tap water. The carcass was then placed on a processing table where the breast meat (deboned breast meat yield without skin) was cut from the remaining upper back and rib cage of the carcass, washed, cooled in ice water tank for two hours, dried for ten minutes. The dressing yield %(DY %), breast muscle yield (BMY %) were recorded according to ***El-Banna et al.*, (2008)**.

3.3.5. Histomorphological examination

At the end of experimental period Six birds from each group were randomly chosen and scarified by cervical dislocation. The intestine was exposed and sample of 0.5 cm from the middle part of glandular stomach, duodenum, jujenum, and ilum were collected and fixed in 10% formalin solution. Specimens were cleared in xylene and embedded in paraffin at 56 degree in hot air oven for twenty four hours. Paraffin bees wax tissue blocks were prepared for sectioning at 4 microns thickness by slide microtome. The obtained tissue sections were collected on glass slides, deparaffinized, and stained by Hematoxylin & Eosin stain for through the light electric microscope ***Banchroft et al.* (1996)**.

3.4. Statistical analyses

All data collected out of the feeding experiments as well as those obtained from the various laboratory tests were statistically analyzed using SPSS® version 18 software PC (2008). Means compared by one- way ANOVA ($P<0.05$) and T-test according to ***Snedecor and Cochran* (1980)**.

4. Results and discussion

Impact of dietary Turmeric *(Curcuma longa)* and/or Cumin*(Cuminum cyminum)* fortification on:

4.1. Growth performance parameters

Data concerning the impact of dietary Turmeric and/or Cumin fortification on overall cumulative growth performance Traits at the end of experimental period were illustrated in Table (2).

Results revealed significant positive effects on most of the growth performance traits as a result of the dietary fortification of cumin and/or turmeric either separately or in combination together. The best growth performance was observed in the birds of (G2, 3 and 4) that were

fed on basal diets fortified with cumin and/or turmeric especially on the fourth and fifth weeks of the experiment. The significant ($P< 0.05$) positive effects in the fortified groups could be partially due to the fact that Cumin stimulates the bile production in the liver of chickens resulting in better digestion and absorption also due to its positive impact on the thyroid hormones secretion. Also the potentiating effects on growth may be due to the improvement in villus height and crypt/ villus ratio of duodenum as the small intestine, especially crypts and villi of the absorptive epithelium, plays a significant role in the final phase of nutrient digestion and assimilation.These observations come in accordance with the observations of ***Monika et al.,*** **(2008)** and ***Nouzarian et al., (2011)*** who reported that Curcumin may stimulate the thyroid hormones secretion a situation indicated that it have a direct link with the process of fat digestion and these stimulate the basal metabolic rate of lipid, So it had been improved feed conversion ratio. ***Platel, (2000)*** and ***Muthamma et al., (2008)*** stated that Cumin seeds increased activity and excretion content of bile acids and increased pancreas and small intestine digestive enzymes such as amylase, trypsin, chymotrypsin and lipase in rats and significantly decreased gastrointestinal transit time and increased retention time in rats. In addition, ***Kumar et al., (2014)*** mentioned that cumin enhance the synthesis of bile acids in the liver and their excretion in bile, what beneficially affects the digestion and absorption of lipids. Also, cumin has an anti-inflammatory effect. However, ***Torki et al. (2015)*** found that diet inclusion of ethanol extract of Propolis (EEP) and/ or Cumin essential oils (CEO) significantly improved BW, BWG and FCR. Birds fed diet containing EEP at 0.2 g/kg had significantly lower plasma concentration of glucose compared to the control group. Results of their study showed that EEP and CEO can be used in diets of broiler chickens at 0.2 g/kg and 0.8 g/kg, respectively with positive effects on performance and blood parameters. These findings agree also with those reported by ***Osawa et al., (1995), Sieo et al., (2005)*** *and* ***Rajput et al. (2013)*** who concluded that the growth stimulating effects of Turmeric may be mediated through its ability to reduce the intestinal pH a condition that favor a better nutrient digestibility and absorbability. The same authors reported an improvement in the utilization of apparent metabolizable energy due to supplementation of broiler diets with Curcumin. Furthermore ***Lee et al.,(2003);*** noticed an enhanced activity of trypsin and amylase in pancreas and small intestine of broiler chickens fed diets supplemented with essential oils, Therefore, the improvement in body weight gain and feed conversion ratio of the birds in our study can be partly attributed to the effects of Curcumin on bile and digestive enzymes production and secretion and consequently better digestion and absorption of the dietary nutrients. Also, weight improvement may be due to the active material (Curcuminoids) found in Curcumin,

causing greater efficiency in the utilization of feed, resulting in enhanced growth. Curcumin has been reported to exhibit antimicrobial properties and ethanol Curcumin extract demonstrated high potential to inhibit some pathogenic bacteria of *chickens* ***Miquel et al., (2002); Ong-ard et al.,(2010).*** Thus a like antibiotic, Curcumin could control and limit the growth and colonization of numerous pathogenic and non- pathogenic species of bacteria in the chicken's gut resulting in balanced gut microbial ecosystems that lead to better feed utilization reflected by improved feed conversion ratio. These findings come in accordance also with the observations of ***Kumari et al., (2007)*** who reported a significant increase in body weight gain of broiler chickens with addition of 1 g/Kg turmeric powder into diet. Moreover, ***Al-Sultan and Gameel (2004)*** reported higher body weight gain in broilers fed diet supplemented with 2.5, 5, and 10 g/Kg of turmeric powder. ***Durrani et al. (2006)*** and ***Rajput et al., (2013)*** reported a significant improvement in body weight gain and feed conversion ratio with addition of 5 g turmeric per Kg of the diet. A linear improvement in body weight gain and feed conversion ratio of broiler chickens with addition of up to 5 g turmeric per Kg of the diet has been reported. ***Lenhardt and Mozes, (2003) Sieo et al., (2005), Fasina et al., (2006), Buchanan et al., (2008), Choct, (2009), Giannenas et al., (2010) and Viveros et al., (2011)*** reported that turmeric supplementation to diets may influence the intestinal structure as it has the ability to alter villus height to crypt depth ratio, of small intestine, so, it plays a vital role in nutrient digestion and absorption by increasing the absorptive area of intestine. On the other hand, ***Emadi and Kermanshahi (2006)*** reported that there was no improvement in feed conversion ratios of broiler chickens fed Turmeric powder supplemented diet.

4.2. Serum Parameters

Results in the table (3) indicated that albumin, ALT, AST, urea, uric acid and creatinine were not affected by any of the dietary treatments a situation indicated that, the liver and kidney functions are normal, and the turmeric and/or cumin addition at the used level of fortification have no hepatotoxic or nephrotoxic effects on young and growing broiler chicks and these findings confirmed the positive impact noticed in growth performance, antioxidant indicators and carcass traits Similar results were reported by ***Al-Noori et al. (2011).*** Most published studies concerning the response of broilers to dietary supplementation of turmeric and/or cumin have been mainly focused on their effects on growth performance parameters and carcass characteristics. Few research activities were carried to visualize the effects of Turmeric and/or cumin on blood and serum parameters of broilers to justify our findings.

4.3. Ant-Oxidant biomarkers

Data presented in table (4) revealed that the highest significant Glutathione (GSH), Glutathione peroxidase (GPx) and Superoxide dismutase (SOD) levels were observed in the birds supplemented with both Cumin and Turmeric in combination together (G4) and followed by those supplemented with Turmeric alone (G3). Meanwhile birds in groups (G2) that were supplemented with Cumin showed the lowest significant Glutathione (GSH) levels among the treated groups, in spite of there were no significant differences among the fortified groups (G2,G3 and G4).Meanwhile the control group (G1) showed a significant lowest levels of (GSH) in comparison to the treated groups. In addition the lowest significant Malondialdehyde (MDA) levels were observed in the birds supplemented with both Cumin and Turmeric in combination together at different stages of growth(G4) and followed by those supplemented with Turmeric alone (G3). Meanwhile birds in groups (G2) that were supplemented with Cumin showed the highest significant Malondialdehyde (MDA)levels among the treated groups, in spite of there were no significant differences among the fortified groups (G2,G3 and G4).Meanwhile the control group (G1) showed a significant lowest levels of (GSH) in comparison to the treated groups. These findings indicated positive impacts of cumin and turmeric alone or in combination together at the abovementioned level of inclusion as antioxidants (reducing oxidative stress) and confirmed and additionally explained the positive effects of such additives on most of growth performance parameters. As the antioxidant effect may be the key requirement of the growth and development of the gastric-intestinal tract of a rapid growing animal and consequently impact the growth. These findings comes in agreement with those reported by ***Joe and Lokesh*, (1994) *and AL-Sultan,* (2003)** who stated that Curcumin has shown to have anti-inflammatory, antioxidant, antimutagenic, anticoagulant, antidiabetic, antibacterial, antifungal, antiprotozoal, anticarcinogenic, antiviral, antifibrotic, antivenom, antiulcer, hypotensive, and hypocholesterolemic activities. The antioxidant activity of Curcumin is attributed to two methylated phenols and an enol form of di-ketone. Curcumin reduces the activity of reactive oxygen species and elevates the antioxidant enzymes superoxide dismutase, catalase, and glutathione peroxidase levels in the blood. Furthermore ***Motterlini et al.,* (2000)**, ***Chattopadhyay et al.,* (2004) *and Bengmark* (2006)** stated that Curcumin is a potent quencher of singlet oxygen species and the major antioxidative component of Curcumin as it has the ability to inhibit lipid peroxidation and scavenge the superoxide anion and hydroxyl radicals ,it was able to inhibit the generation of reactive oxygen species, such as superoxide anions, H_2O_2 and nitrite radical generation by activated macrophages, they added that

Curcumin was also shown to decrease lipid peroxidation in rat liver microsomes, erythrocyte membranes and brain homogenates . ***Al-Snafi, AE,*** **(2015)** reported that the antioxidant parameters including activity of reduced glutathione, glutathione peroxidase (GPx) and superoxide dismutase (SOD) and malondialdehyde (MDA) in birds fed Curcumin and/or cumin in diets. Broilers fed diets supplemented with Curcumin and/or cumin significantly increased reduced glutathione, glutathione peroxidase as well as superoxide dismutase compared to control group. Moreover, broilers fed diets supplemented with Curcumin and/or cumin significantly decreased malondialdehyde (MDA) compared to control group. Antioxidant capability of Curcuminoids such as Curcumin, have antioxidative, anti-inflammatory, anticarcinogenic and antihepatotoxic activities. These Curcuminoids are major antioxidative compounds of Curcumin .

Concerning the antioxidant properties of Cumin ***El-Sawi and Mohamed,*** **(2002)** ***and Romeilah et al.*****, (2010)** reported that Cumin contains 2.5–4% aromatic essential oils (cuminaldehyde and other aldehydes), and also a high concentration of antioxidant compound, especially flavonoids and terpenes. The Cumin oil showed higher antioxidant activity compared with that of BHT and BHA and exhibited a dose-dependent scavenging of DPPH radicals and 5.4 microg of the oil was sufficient to scavenge 50% of DPPH radicals/ml , the antioxidant activity of essential oils was evaluated by DPPH radical scavenging assay, radical inhibition of Cuminum cyminum essential oils was 83.59%, the scavenging activities of the essential oil was increased with the increased of the essential oil concentrations. In addition to the above-mentioned modality of action, these findings could be attributed to the fact that cumin and turmeric fortification in a powdered form alone or in combination together improved villus development, total (GSH), (GPx) and (SOD) production and potentiating the anti-oxidant status and improve redox statue as a result of increasing the antioxidant capacity and the antioxidative role of both spices and might have beneficial effects in reducing lipid peroxidation in the birds.

4.4. Carcass traits:

Results (table 5) indicated that there were significant improvements in dressing percentage, breast weight in groups fed on Curcumin and/or cumin supplemented diets while there was a significant improvement in the thigh weight only in the Curcumin + cumin supplemented group. Moreover, no significant difference was observed in the liver or spleen weights. The obtained results coincided with the results reported by ***Durrani et al.*** **(2006)** who indicated higher dressing percentage, as well as breast and thigh weights of broilers fed a diet containing 5 g/kg of turmeric powder. Our results however, disagree with the findings of ***Mehala and***

***Moorthy* (2008)** who did not observe any significant impact of Curcumin powder on carcass percentage of broiler chickens reared to 42 days of age. In regard to cumin our results agree with ***Al-Kassi* (2010)** and disagree with ***Pish- Jang* (2011)**. This discrepancy could be due to the different levels of Curcumin or cumin in the diet and the use of different broiler breeds

4.5. Histo-morphological Picture:

Results (Fig1) revealed normal histo-morphological structure without any histopathological alteration of the hepatocytes in lacunae; sinusoids and central vein were recorded. Also no histopathological alteration and the normal histological structure of the intestinal villi with lining mucosal epithelium and underlying musculature and serosa. In the cumin and Curcumin supplemented groups, the mucosal lining epithelium showed proliferation and diffuse goblet cells proliferation in diffuse manner with normal underlying musculature and serosa (Fig2). It is of note that mucous of goblet cells protect mucous membrane and lubricate and protect intestinal mucosa. In the cumin + Curcumin supplemented group (Fig3), diffuse goblet cells formation was detected all over the lining mucosal epithelium associated with narrowing in the crypts with hypertrophy of musculature and serosal layer (Fig4). Concerning pancreas, there was no histopathological alteration and the normal histological structure of the islands of Langerhans cells as endocrine portion as well as the acini and ducts system as exocrine one were recorded in the control and cumin supplemented groups. In the Curcumin and cumin + Curcumin supplemented groups, proliferation and hypertrophy were detected in the islands of Langerhans cells. The hypertrophy in islands of Langerhans cells indicate that Curcumin supplementation leads to activation of the islands cells which is responsible for the adjustment of glucose level in the blood.

It could be concluded that, the Cobb500 broiler breed responds positively to dietary Turmeric *(Curcuma longa)* and/or Cumin *(Cyminum cyminum)* fortification at a rate of 3 Kg/ton as they have a Positive impact on most of the growth performance parameters,- Not adversely affected most of serum parameters in terms of Albumin, AST,AST Urea and Creatinine.In addition they have positive impacts on oxidation stress indicators as it resulted in a significant elevation of the levels of Glutathione peroxidase (GSH), Glutathione peroxidase (GPx) and superoxide dismutase(SOD) and lowest significant Malondialdehyde (MDA) levels. A situation that indicated improvements of the antioxidant capacity and reducing oxidative stress. Significantly improve most of the carcass traits, not adversely affected gut morphology as indicated by normal histo-morphological structure without any histo-pathological alteration of the hepatocytes, intestinal strictures and of the pancreatic tissue and positive changes in the histomorpholoigcal picture of the duodenal mucosa and its cell proliferation and differentiation

a situation that indicated the cost effectiveness and economic feasibility of their use as effective phytogenic feed additives.

Table (1): Physical and chemical composition of the basal diets used in experiment.

Ingredients	Starter (1-15) day	Grower (16-24) day	Finisher (25-38) day
Yellow corn	575	619	668
Corn gluten meal 60%	20	20	22
Soybean meal 48%	365	319	265
Soy oil	5	10	15
Dicalcium phosphate	13	12.5	11
Limestone	11	10	10
Common salt	2.65	2.75	2.1
DL-Methionine	1.85	1.5	1.25
L-Lysine	3.25	2	2.4
Toxin binder	0.25	0.25	0.25
Broiler premix*	3	3	3
Total	1000	1000	1000
Calculated, chemical analysis			
ME (Kcal/kg)	3000	3100	3200
Crude protein %	23	21	19
Calcium %	0.95	0.90	0.85
Available phosphorus %	0.45	0.42	0.4

*Per Kg premix: 1200000 IU vit A, 350000 vit D3, 4000 mg vit E, 250 mg vit B1, 800 mg vit B2, 600, mg vit B6, 3.2 mg vit B12, 450 mg vit K3, 4.5 g nicotinic acid, 1.5 g Ca pantothenate, 120 mg folic acid, 5mg biotin, 55 g choline chloride, 3 g Fe, 2 g Cu, 10 g Mn, 8 g Zn, 120 mg I, 40 mg Co.

Table (2): Overall Growth performance of broiler chickens fed diets supplemented with Curcumin and/or Cumin at the end of the experimental period.

Groups / Parameter	G1 (Control)	G2 Cumin	G3 Curcumin	G4 Curcumin
Initial body weight (g)	45.1 ±0.065	46.4 ±0.311	44.7 ±0.233	46.7 ±0.241
Final body weight (g)	2050.9 ±2.12	2100.05** ±9.096	2120.05* ±7.57	2168.6** ±9.92
Total body gain (g)	2005.7 ±3.055	2053.6 ±2.516	2080.3* ±3.756	2122.7* ±3.055
Overall FCR	1.84 ±0.008	1.65 ±0.011	1.58 ±0.006	1.54 ±0.11

-Values are means ±SE * significantly different at P ≤ 0.05 ** significantly different P≤ 0.01.

Table (3): Levels (means ±SE) of selected serum parameters of broiler chickens fed diets supplemented with Curcumin and/or Cumin at the end of the experimental period.

Groups / Parameter	G1 (Control)	G2 Cumin	G3 Curcumin	G4 Curcumin
Albumin (IU/L)	1.4 ±0.115	1.4 ±0.577	1.7 ±0.133	1.4 ±0.088
AST (IU/L)	136.33 ±6.98	146.0 ±8.18	148.66 ±14.99	133.66 ±2.96
ALT (IU/L)	7.8 ±0.404	7.7 ±0.260	8.1 ±0.702	7.9 ±0.417
BUN (mg/dL)	2.33 ±0.13	2.40 ±0.17	2.50 ±0.21	2.33 ±0.15
Creatinine (mg/dL)	0.32 ±0.05	0.34 ±0.07	0.36 ±0.06	0.43 ±0.08

Table (4): Levels (means ±SE) of some antioxidant biomarkers of broiler chickens fed diets supplemented with Curcumin and/or Cumin at the end of the experimental period.

Groups / Parameter	G1 (Control)	G2 Cumin	G3 Curcumin	G4 Curcumin
Reduced Glutathione (GSH) (mM/g tissue)	2.62 ±0.164	3.42* ±0.236	3.59* ±0.294	3.69* ±0.467
GPx (U/mg protein)	17.28 ±0.532	20.74* ±0.780	25.22* ±0.664	28.74* ±1.16
Superoxide Dismutase (U/mg protein)	64.25 ±2.51	70.85* ±3.22	74.61* ±3.002	81.52** ±3.57
MDA (nM/g tissue)	9.65 ±1.53	6.21* ±1.05	6.57* ±0.38	4.96* ±0.877

-* significantly different at $P \leq 0.05$ ** significantly different $P \leq 0.01$.

Table (5): Impact of dietary Turmeric and/or cumin supplementation on some carcass traits and organ indices at the end of the experimental period

Groups / Parameter	G1 (Control)		G2 Cumin		G3 Curcumin		G4 Curcumin + Cumin	
	Wt. (g.)	%	Wt. (g.)	%	Wt. (g.)	%	Wt. (g.)	%
Dressing	1420.1 ±29.48	69.2	1460.67* ±28.66	69.52	1490.2* ±22.85	70.28	1512.67* ±21.83	69.77
Breast	425.50 ±8.38	29.9	458.33* ±5.64	31.37	465.67* ±2.41	31.24	485.83* ±2.27	32.11
Thigh	307.50 ±3.354	21.6	315.83 ±4.020	21.62	319.83 ±1.078	21.40	325.67* ±1.647	21.49
Liver	34.31 ±0.981	013	34.90 ±0.934	0.141	34.133 ±0.760	0.158	40.950 ±0.328	0.156
spleen	1.77 ±0.146	2.41	2.26 ±0.118	2.78	2.046 ±0.010	2.70	2.31 ±0.015	2.88

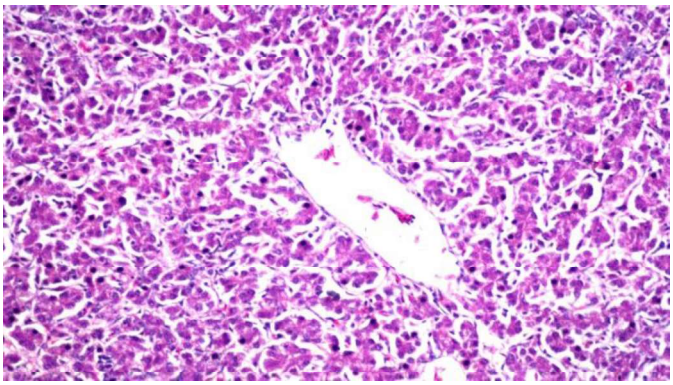

Fig. (1): showing normal histological structure of the hepatocytes in lucunae with hepatic sinusoids and central vein.

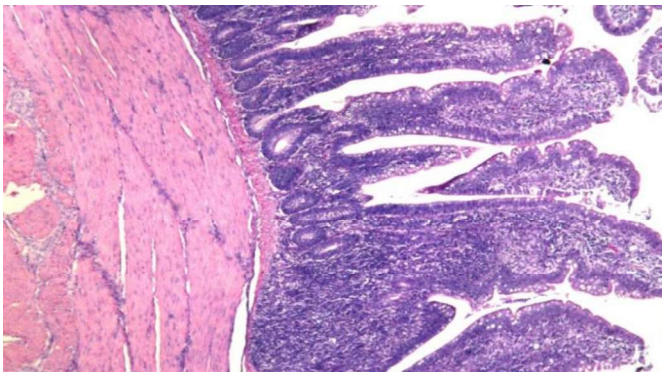

Fig. (2): activation of lining epithelium with goblet cells and normal undailying musculature.

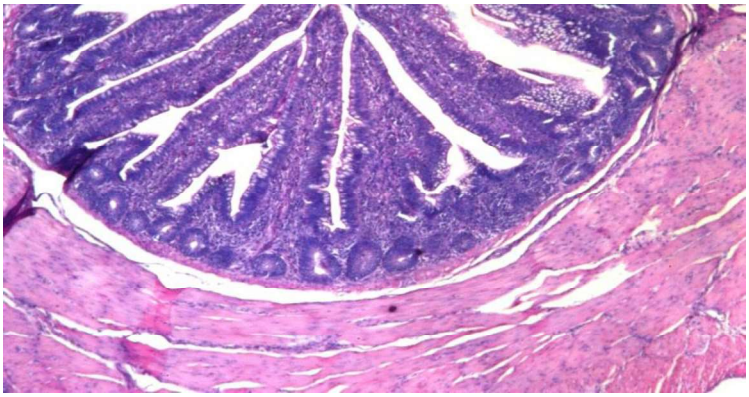

Fig. (3): Showing intact histological structure of the villi with lining mucosal epithelium and goblet cells as well as narrowing crypt. formationas as well as narrowing crypt

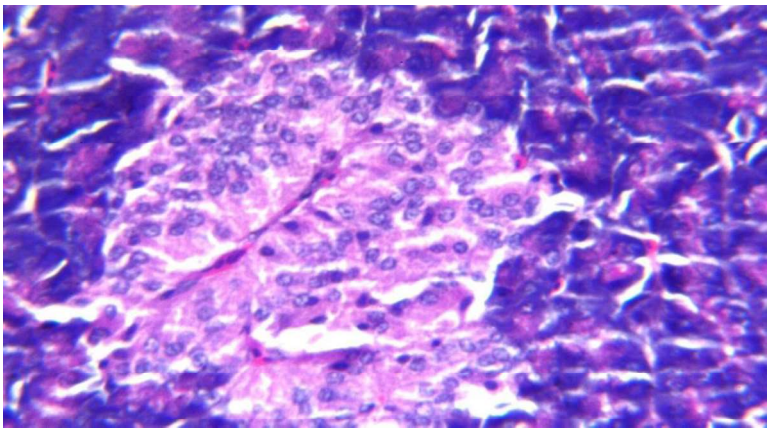

Fig. (4): Showing hypertrophy and proliferation in langerhans cells.

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