Effect of Adding Different Levels of Lemon Grass *Cymbopogon citratus* Leaves to the Diet or Adding its Extract in Drinking Water on Microbial Content of Broiler Chickens (Ross 308) Gut

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Abstract

This experiment was conducted at the Poultry Farm of the Faculty of Agriculture, University of Al-Qasim Green during the period from 18/9/2019 to 23/10/2019. The study aimed to study the effect of adding different levels of lemongrass leaves (*Cymbopogon citratus*) to the diet or its extract to drinking water on microbial content the gut of broiler chickens (Ross 308). 225 unsexed broiler chicks (Ross), which obtained from Al-Anwar hatchery, were randomly distributed on 15 pen, with 5 experimental treatments, and 45 birds for each treatment. Each treatment included three replicates per 15 birds. The treatments of the experiment were as follows: First treatment: control group free from any addition. The second treatment: a basic feed added to 10 g of lemon grass/kg feed, the third treatment: a basic feed added with 20 g of lemon grass/kg feed, the fourth treatment: adding 100 ml of the aqueous extract of the lemongrass/liter of drinking water, and the fifth treatment: adding 200 ml of the aqueous extract of the lemongrass liter of drinking water. The experiment included studying the following characteristics: The number of total aerobic bacteria, colon bacteria and lactobacilli. Significant decrease ($p \leq 0.05$) in logarithmic number of aerobic and Coliformis bacteria, with a significant increase ($p \leq 0.05$) in logarithmic Lactobacillus bacteria in duodenal of the small intestine as well as in cecum in the addition treatments (second, third, fourth and fifth) compared to the first treatment (control).

Key words: Lemon grass, *Cymbopogon citratus*, Broiler chicken**,** Microbial content, Gut of broiler.

Introduction:

Medicinal plants contain many active compounds with different effects and they are either present in the plant or in the form of metabolic products and these materials are divided into either a toxic and deadly type or beneficial and nutritious (Al-Ani, 2002). Herbs have been used in the treatment of health problems that appear in poultry, these were used medicinal and aromatic plants and their extracts for improving health (Al-Shahat, 2000). Some plant extracts have a stimulating effect on the digestive

system of animals and poultry, as they improve the function of organs, especially the liver, and this leads to an increase in digestive enzymes that increase the benefit from eating food and meeting the needs of the body (Jamroz and Kamel, 2002). the feeds and natural additives are among the components that affect improving growth as well as food conversion, so plants and medicinal herbs have been used in recent years to feed animals (Hassan and Muhamad, 2007). Plant extracts have been used to treat many diseases, especially animal respiratory diseases (Al-Shahat, 1986), and lemon grass *cymbogon citratus* is one of these plants. It is considered one of the medicinal plants wide use since ancient times and it is an aromatic herb perennial with long and smooth leaves. It lives in hot countries such as Egypt, Sudan, Saudi Arabia, India, Ceylon and East Africa (El-Degwy, 1996). Recent and ancient studies have shown that this plant has many medicinal benefits for its high content of volatile oil, which contains many compounds, especially the main compound Citral, which ranges between 65-90% and the compound myosin 10-25% and neighbors 1-4%, as this plant is used as a disinfectant and analgesic for headaches, and the treatment of rheumatism, as it is antihypertensive and is useful in treating ulcers and colitis as well as cold and flu diseases (Al-Rawi and Jakerh, 1988). Also, it considered as inhibitor of the growth of microorganisms and fungi (Al-Sadiq, 2006). It has also been used industrially for food preservation and flavor addition (Tarab and Shawwa, 2000). With the increase in the global population of nearly seven billion people, and expectations that this number will reach eight billion in 2020 and with an annual increase of 93-95 million (Gore, 1993). This increase will accompany with the diseases of the modern era and the danger resulting from the side effects of the chemical drugs used, all these reasons were sufficient to go or advise people to go to nature in search of plants with a medical effect in treating diseases and that most of the diseases that we suffer from find the solution in nature more than in pharmacy, and that pharmacology is used in the broadest field of nature herbs for the composition of drugs and medicines (Al-Mayah, 2001). Based on the above of the foregoing, and given the great importance of the leaves of the lemon grass plant, the aim of the present study is to find out the nutritional value of the powder of lemon grass plant and its use and determination the best of proportions that preferred to be added to the diet or to drinking water that can be used in poultry diets and its impact on productive performance.

Materials and Methods:

This experiment was conducted at the Poultry Farm of the Faculty of Agriculture, University of Al-Qasim Green during the period from 18/9/2019 to 23/10/2019. The study aimed to study the effect of adding different levels of lemongrass leaves (*Cymbopogon citratus*) to the diet or its extract to drinking water on microbial content of the gut of broiler chickens (Ross 308). 225 unsexed broiler chicks (Ross),

were obtained from Al-Anwar hatchery, and were randomly distributed on 15 pens, with 5 experimental treatments, where 45 birds for each treatment. Each treatment included three replicates with 15 birds**.** The treatments of the experiment were as follows: First treatment: control group free from any addition . The second treatment: a basic feed added to 10 g of lemon grass/kg feed, the third treatment: a basic feed added with 20 g of lemon grass/kg feed, the fourth treatment: adding 100 ml of the aqueous extract of the lemongrass / liter of drinking water, and the fifth treatment: adding 200 ml of the aqueous extract of the lemongrass/liter of drinking water. The experiment included the study of the following traits: The number of total aerobic bacteria and colon bacteria and lactobacilli. Completely randomized design was used to study the effect of different treatments on the studied traits, and the significant differences between the averages were compared using Duncan's Multiple Range Test (Duncan, 1955) and SAS (SAS, 2012) software was used to analyze the data.

Table 1. Percentage of feed materials included in the composition of the initial diet and final diet used in the experiment with the calculated chemical composition for both diets.

Feed material	Initiator diet (1-21) %	Final diet (22-35 day) %
Yellow corn	48.2	58.7
Local wheat	8	7.5
Soybean meal (44% protein)	28.5	20.5
Concentrated Protein*	10	10
Vegetable oil (sunflower)	4	2.5
Limestone	1	0.5
Food salt	0.3	0.3
Total	%100	%100
Calculated chemical analysis **		
Metabolized Energy (kcal/kg)	3079.85	3102.6
Crude protein (%)	21.56	18.87
Lysine (%)	1.04	0.85
Methionine + Cysteine (%)	0.455	0.42
Raw fiber (%)	3.54	3.2
Calcium (%)	1.28	1.07
Phosphorus availability (%)	0.42	0.41

***Concentrated protein (Belgian origin), each kilogram contains: 2200 kcal/kg metabolized energy, 40% crude protein, 8% fat, 3.5% fiber, 25% ash, 8% calcium, 3.1 phosphorus availability, 1.2% lysine, 1.2% Methionine, 1.8% Methionine + 70 mg, 30 mg Vitamin B1, 300 mg Vitamin E, 2500 IU D3, Cysteine A, 2% Chlorine, 10,000 IU 12 mg Folic Acid, 250 mg B12, B 120 mg Pantothenic acid, 400. mg niacin, 50 mg vitamin B2, 5000 mg Choline chloride, 450 mg iron, 70 mg copper, 600 mg, C 600 mcg biotin, 1000 mg special vitamin, 750 manganese , 5 mg iodine, 1 g cobalt and antioxidants.**

**** chemical composition was calculated according to analysis of feed materials mentioned in (NRC,** 1994).

Results and Discussion:

Table (2) shows the effect of adding different levels of lemongrass leaves or its extract to drinking water on the logarithmic numbers of the total aerobic bacteria, colon bacteria, and lactobacillus (cfu/gr) for the duodenal and greek contents of broilers at the age of 35 days, as the table indicates a significant ($P \leq 0.05$) decrease in the logarithmic numbers of the total aerobic bacteria and coliform bacteria in the duodenum and the cecum in favor of transactions of lemon valerian leaf or its extract to drinking water compared to the first treatment that recorded the highest logarithmic numbers of the total aerobic

bacteria and coliform bacteria in the duodenum and the aurin amounted to 5.34 and 11.31 cfu/gr, respectively, 3.86 and 7.45 cfu/gr, respectively. The same tabulation also shows a significant superiority (P≤0.05) in favor of treatments for lemon leaves or their extract to drinking water in the numbers of Lactobacillus bacteria for the duodenum regions). The aurin when compared to the first treatment (control), the fifth treatment recorded the highest rate of Lactobacillus bacteria compared to the rest of the treatments in the duodenal region.

Table 2. Effect of adding different levels of lemon grass leaves or its extract to drinking water in the logarithmic numbers of total aerobic bacteria, coliform bacteria and lactobacillus bacteria (cfu) / gr) for Duodenum and Cecum contents of broiler meat at the age of 5 weeks (mean ± standard error)

Treatments	Duodenum			Cecum		
	Total air bacteria	coliform bacteria	Lactobacillus bacteria	Total air bacteria	coliform bacteria	Lactobacillus bacteria
First treatment	5.34±0.08 a	11.31±0.05 a	3.69±0.09 d	3.86±0.06 a	7.45±0.05 a	2.82±0.04 b
Second treatment	4.52±0.04 b	10.61±0.05 b	4.25±0.06 c	3.42±0.06 bc	7.07±0.02 b	3.57±0.06 a
Third treatment	4.47±0.05 b	10.62±0.06 b	4.36±0.09 bc	3.46±0.07 b	6.87±0.06 c	3.60±0.09 a
Fourth treatment	4.34±0.06 b	10.46±0.06 bc	4.62±0.05 ab	3.2±60.06 bc	6.61±0.05 d	3.74±0.04 a
Fifth treatment	4.47±0.06 b	10.34±0.06 c	4.72±0.10 a	3.22±0.06 c	6.39±0.04 e	3.67±0.07 a
Significant level	*	*	*	*	*	*

First treatment: control group free from any addition . The second treatment: a basic feed added to 10 g of lemon grass/kg feed, the third treatment: a basic feed added with 20 g of lemon grass / kg feed, The fourth treatment: adding 100 ml of the aqueous extract of the lemongrass / liter of drinking water, and the fifth treatment: adding 200 ml of the aqueous extract of the lemongrass liter of drinking water.

The treatments of lemon grass leaves, either with fodder or drinking water, gave the best results in the decrease in the numbers of total aerobic bacteria and coliform bacteria, with an increase in the numbers of anaerobic bacteria represented by lactobacilli bacteria, due to the effectiveness of lemon valerian leaves because they contain phenolic acids, flavonoids and tannins. They act as natural antioxidants and antimicrobials (Hasim *et al*., 2015; Dian; *et al*., 2017) as they inhibit many pathogenic bacteria, in particular *Escherichia coli*, *klebsiella*, *Pneumonia proteus*, *Staphlococcus aureus*, as well as they have a counter activity against the negative and positive pathogenic bacteria of the dye-staining (Hassoun and Mustafa, 2009; Al-Ani *et al*., 2013). Most of the active compounds or substances such as pinene, α-pinene γ-terpinene B - and limonene affect the structural and functional characteristics of the cell membrane in the microorganisms and affect the permeability of the membranes and then influence the performance of these organisms and their vitality, and therefore the active substances in the lemon leaves Important in promoting and supporting the microbial balance of the intestinal environment by

killing or inhibiting harmful microorganisms, thus beneficial bacteria (Lactobacilli) outperform their numbers on harmful bacteria, and thus support the microbial balance within the intestine (Bharti *et al*., 2013), as beneficial microorganisms outperform microorganisms harmful to number because the active compounds of the lemon grass have an effective antimicrobial and antibacterial activity against harmful or pathogenic bacteria (Cheel *et al*., 2005).

Conclusion:

The research concluded that the treatments of lemon grass leaves, either with fodder or drinking water, gave the best results in the decrease in the numbers of total aerobic bacteria and coliform bacteria, with an increase in the numbers of anaerobic bacteria represented by lactobacilli bacteria.

References:

Al-Ani, Ibrahim Abdel-Karim Abdel-Rahman, Diyar Taha Yassin Al-Zakrout, and Saeed Aliwi Fayyad Al-Muhammadi. 2013. The inhibitory effect of ginger and lemon grass in proteus bacteria isolated from urinary tract infection patients, Anbar Journal of Agricultural Sciences Vol (6) No. (2).

Al-Ani, W.Y.M. (2002). Extracting some of the effective compounds in *Prosopis farcta*, and determining their vital activity. PhD thesis, College of Science, Anbar University.

Al-Dajwi, A. (1996). Medicinal and aromatic plants. Madbouly Bookstore, Egypt.

Al-Mayah, A.A.A. (2001). Medicinal plants and herbal medication. Abadi Center for Studies and Publishing, Sanaa, Yemen.

Al-Rawi, and J. Varti (1988). Medicinal plants in Iraq. Second edition, Al-Yaqdah Library, Baghdad.

Al-Sadiq, S.M.A.M. (2005). The effect of some compounds extracted from lemon and thyme on the types of Candida and bacteria isolated from the mouths of children with oral thrush. Master Thesis, College of Science for Girls, Baghdad University, Ministry of Higher Education and Scientific Research, Republic of Iraq.

Al-Shahat, A.Z.N. (2000). Volatile oils. The Arab Publishing and Distribution House. First Edition National Research Center, Cairo. Egypt.

Al-Shahat, A.Z.N. (1996). Medicinal plants and herbs, Dar Al-Najjar. Beirut. Lebanon.

Bharti, S.K.; A. Kumar; O. Prakash; S. Krishnan; and A.K. Gupta (2013). Essential oil of *Cymbopogon Citratus* against diabetes: Validation by *In vivo* experiments and computational studies. J. Bioanal Biomed., 5: 194-203.

Cheel, J.C.; J. Theoduloz; G. Rodriguez; and S. Hirschmann (2005). Free radical scavengers and antioxidants from Lemongrass (*Cymbopogon citratus*). J. Agric. Food Chem., 53: 2511-2517.

Dian, M.S.; L. Trilianty; D.A. Fransisca; J. Helena; and T. Iskandar (2017). Antioxidant and anti-glycation activity of ethanol lemongrass (*Cymbopogon citratus*) leaves extract. Inter. J. Pharm. and Phytochem. Res., 9(5): 710-715.

Duncan, D.B. (1955). Multiple range multiple F-test-Biometeics.11:1 – 42.

Gore, A. (1993). Earth in the balance: Ecology and human spirit, plume book: proceeding of the11thinternationalcongressonnitroge fixation (C. Emerich; A. Konorsi; and W.E. Newton). Kluweracademic publisher. Dorrecht, Boston, London. Pp. 685- 692.

Hasim, S.F.; R.D. Ayunda; and D.N. Faridah (2015). Potential of lemongrass leaves extract (*Cymbopogon citratus*) as prevention for oil oxidation. J. Chem .Pharm. Res., 7(10):55-60.

Hassan, S.; and S.M.N. Muhamad (2007). Effect of barley straw treatment with urea on chemical composition, *In vitro* digestibility, pH, and phenolic compound, Aerobic and un anaerobic bacteria. 6th Scientific Conf. for Agric. Res. Iraq. 12(3):136-144.

Hassoun, B.A.A.; and M.S. Muhammad (2009).Study of the effect of lemon grass on some negative and positive bacteria of dye Karam. Journal of the College of Basic Education. No. 58.

Jamroz, D.; and C. Kamel (2002). Plant extracts enhance broiler performance. J. Anim. Sci., 80 (Suppli): 41 (Abstract).

N.R.C. National Research council .1994. Nutrient Requirement of Poultry. (9th rev. ed.). National Research Council. Nat. Academy Press, Washington, D.S., USA.

SAS. (2012). Statistical Analysis System, User's Guide. Statistical. Version 9.1th ed. SAS. Inst. Inc. Cary. N.C. USA.

Tarab, M.; and S. Luke (2000). Thousand epidemic disease and medication. House of generation. Beirut, Lebanon.