

Effect Adding Different Levels of Lemongrass Leaves Powder to the Dietary on the Meat Traits of Broilers

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Abstract. This study was conducted in broiler field / college of Agriculture/ Tikrit University during 9-4 to 14-5-2019 to know the effect of adding lemongrass leaves powder to the dietary on meats traits of broilers. 135 chicks Ross-308 were distributed randomly to three treatments, each treatment divided into three replicates (15 birds per replicate). T1 was standard treatment; T2 and T3 were added 1g and 2g of lemongrass per one kg of diet, respectively. The results showed a significant decrease ($P \leq 0.05$) in T2 compared with other treatments in cooking loss and water holding capacity, otherwise, T2 increased significantly ($P \leq 0.05$) in the thawing loss compared with T1, the treatments did not differ significantly in the dripping loss. T2 and T3 increased significantly in protein percentage compared with T1, while these treatments were decreased significantly ($P \leq 0.05$) compared with T1 in the fat and moisture percentages, the per cent of meat ash did not differ significantly among treatments. The Peroxide Value, Thiobarbituric acid and Free Fatty Acids significantly increased ($P \leq 0.05$) in T2 and T3 compared with T1. The percentage of all fatty acids like linoleic, oleic, stearic, palmitic and linolenic increased significantly ($P \leq 0.05$) in T2 and T3 compared with T1. We conclude from this study that adding lemongrass powder to broiler diets improved most of the physical and chemical traits of meat.

Keywords. Broilers, Lemongrass, Physical and chemical traits of meat, Oxidation indexes.

I. INTRODUCTION

The broilers meat is one of the main food sources of animal protein for people's consumption, due to its high rich in protein, which is considered high biological value, vitamins and minerals Vitamins, poultry meat is suitable for human health because of the low continent of fat and cholesterol [1,2]. Lemongrass (*Cymbopogon citratus*) is an aromatic, tall perennial herbaceous plant with thick green sword-like leaves, it belongs to the Nigella family, it is found in tropical regions and in Asia, North Africa and Central America, its high composition of phytochemicals such as tannins, phenols and flavonoids that act to prevent oxidation and prolong the storage period for meat [3-6]. [7] The presence of antioxidants in lemongrass and further suggested that the dry lemongrass contains more phenol and flavonoids than fresh lemon [8-10]. Lemongrass leaves contain about 13% moisture, 7.6% ash, 2.4% crude fat, 29.4% crude fiber and 4.45% crude protein[11]. [12] and [13] did not found significant differ ($P \geq 0.05$) of lemongrass on the quality of carcass and meat of broiler when adding lemongrass to drinking water. [14] Found the supplementation of Lemongrass to quails dietary did not effect on cooking loss, thawing loss, dry matter, ash and protein percentage of meat. Adding lemongrass to chicken meat inhibits fat oxidation and formation of peroxides value, thiobarbituric acid and free fatty acids contributes to the chemical and physical stability of the meat [15]. This study evaluates the chemical characteristics of broilers meat that fed with different levels of Lemongrass leaves powder their diet.

II. MATERIALS AND METHODS

This study was conducted in the broiler house of the College of Agriculture/ Tikrit University during the period from 9/4 to 14/5/2019 to knowing the effect of adding lemongrass leaves powder to dietary on the meat traits of broilers. 135 - day old broiler chick Ross 308 with 2 weeks of age distributed to three treatments each treatment divided into three replicates (15 birds for each). The birds have been rearing in floor pens include sawdust. The lighting was continuous. The water and feed were provided to birds ad libitum during the study period. The lemongrass powders were opting from the local market and added to rations according to treatments. The birds have been feeding with three rations as shown in (table I). T1 was standard ration (control), T2 and T3 were standard feed with add 1 and 2g / kg of feed, respectively.

TABLE 1. Feed material that used in broiler dietary and the chemical composition of feed.

Ingredients	Starter ration%	Grower ration%	Final ration%
Maze	56.9	59.61	62.87
Soybean meal 48%	34	30.1	26.4
Protein concentration*	5	5	5
Sunflower oil	1.8	2.9	3.8
Calcium Diphosphate	1.26	1.16	1
Limestone	0.67	0.7	0.65
Lysine	0.2	0.14	0.13
Methionine +Cysteine	0.08	0.09	0.02
Salt	0.09	0.3	0.13
Total	100	100	100
**Chemical composition			
Metabolic energy (kilocalorie/kg feed)	3000	3100	3200
Crude protein%	23	21.5	20
Crude fibres%	3.77	3.57	3.39
Lysine%	1.44	1.29	1.19
Methionine%	0.57	0.56	0.48
Methionine + Cysteine%	0.92	0.89	0.79
Calcium%	0.96	0.87	0.81
Phosphor%	0.48	0.43	0.40

* WAFI Protein concentrate contains: 40% Crude Protein, 5% Fat, 3.04% Calcium, 5.39% Available Phosphor, Lysine 3.85%, Methionine 3.70%, Methionine+cysteine 4.13%, Metabolized Energy 2157 Kcal / kg, Crude Fibres 3.20%, Sodium 2.40%, Chloride 4.16%, 200,000 IU / kg Vitamin A, 80,000 IU / kg Vitamin D3, 600 mg / kg Vitamin E, 60 mg / kg Vitamin B1 , 140 mg / kg Vitamin B2, 80 mg / kg Vitamin B6, 700 mg / kg Vitamin B12, 2 mg / kg Vitamin H (biotin), 800 mg / kg Niacin, 20 mg / kg Folic Acid, 50 mg / kg Vitamin K.

** The chemical compositions of diets calculated according to [16].

The birds were slaughtered at 35 days of age and then the carcasses were weighed and then put in polyethylene bags, dripping loss calculated after chilling carcasses at 4°C for one day [17]. The thawing loss was calculated after freezing the carcasses at -18° C for 3 days [18]. The cooking loss of meat was calculated with the barbecue method [19]. The water holding capacity is calculated by the pressed method of meat according to [20]. The chemical composition of meat such as percentage of moisture, protein, fat and ash had been done according to [21]. The fatty acids concentrations of meat were estimated by Gas Chromatography [22]. The oxidation indicators of meat that were stored frozen for forty-five days, like peroxide value and free fatty acids were estimated according to [23], but the Thiobarbituric acid estimation of according to [24]. The data of this study were analysed in the SAS program 2010 [25] and by Complete Random Design to find the effect of the treatments on the different traits by using the Duncan multi-range test [26] to know the significant difference between treatments.

III. RESULTS AND DISCUSSIONS

The results in (table II) showed the effect of adding different levels of lemongrass leaves powder to the diet on the physical traits of broilers meat. Dripping loss did not have significant differences among treatments. The cooking loss and water holding capacity decreased significantly ($P \leq 0.05$) in T2 compared with T1 and T3, while the thawing loss increased significantly ($P \leq 0.05$) in T2 compared with T1 but did not differ significantly compared with T3. This study disagreed with [13] who found drip loss and water holding capacity did not differ significantly in broilers meat fed in lemongrass powder. This study was agreed with [27] which have documented the cooking loss when adding lemongrass to lamb meat. The significant decreased in T2 compared with T1 may be due to the increase in the moisture percentage of meat in T1 because this characteristic depends heavily on the moisture content of the meat [27] Which is due to low protein content in T1.

TABLE 2. Effect of lemongrass on physical traits of broilers meat(mean± standard error).

Treatments Traits	T1	T2	T3
Cooking loss %	27.37 a ± 0.74	22.55 b ± 0.99	28.62 a ± 0.14
Water Holding Capacity %	25.00 a ± 0.66	23.50 b ± 0.95	25.75 a ± 0.38
Thawing loss %	1.73 b ± 0.11	2.60 a ± 0.15	2.23 ab ± 0.29
Dripping loss %	0.50 ± 0.13	0.70 ± 0.08	0.77 ± 0.13

T1- standard feed, T2 and T3 were standard feed added 1g and 2g of lemongrass powder/kg feed, respectively.
 - Different letters in the same row indicate significant differences among means of treatments ($P \leq 0.05$).

The percentage of meat protein was increased significantly ($P \leq 0.05$) in T2 and T3 compared with T1 (table III). The percentage of fat and moisture decreased significantly ($P \leq 0.05$) in T2 and T3 compared with T1. The treatments did not significantly differ ($P \leq 0.05$) in the percentage of ash meat. This study disagreed with [12] who were not found significant among treatment in chemical traits of broilers meat when fed on lemongrass. Studies have indicated that phenolic compounds act as antioxidants that contribute to the protection and stability of meat cell membranes by suppressing free radicals resulting from fat oxidation, reducing the rupture of cell membranes surrounding muscle fibers and preserving the integrity of these membranes [28]. The moral improvement is also due to the plant's containing flavonoids, which are similar in structure and action to steroid hormones. These compounds increase the rates of metabolism by supporting and manufacturing structural proteins to build muscle mass and other tissues in the body [29]. The significant decrease in the percentage of fat in the thigh is due to an increase in the proportion of linoleic fatty acid in the meat, which works on oxidation of fats, increased metabolic processes, and thus a decrease in the proportion of fat in the tissues [30]. The decreased meat moisture percentage in T2 and T3 due to increased meat protein percentage of these treatments there is an inverse relationship between moisture and protein percentage of meat [31].

TABLE 3. Effect of lemongrass on chemical composition of broilers meat (mean \pm standard error).

Treatments Traits	T1	T2	T3
Crude protein%	17.16 b \pm 0.16	21.23 a \pm 0.26	20.71 a \pm 0.36
Fat %	7.83 a \pm 0.17	5.66 b \pm 0.54	6.33 b \pm 0.24
Ash %	1.83 \pm 0.11	1.48 \pm 0.11	1.45 \pm 0.24
Moisture %	73.13 a \pm 0.23	71.61 b \pm 0.19	71.45 b \pm 0.49

T1- standard feed, T2 and T3 were standard feed added 1g and 2g of lemongrass powder/kg feed, respectively.
 - Different letters in the same row indicate significant differences among means of treatments ($P \leq 0.05$).

All oxidation indicators such as Thiobarbituric Acid (table IV), the Peroxide Value and Free Fatty Acids were increased significant ($P \leq 0.05$) in T2 and T3 compared with T1 in meat stored in the freezer for forty-five days. This result did not agree with [32] did not find significant differences among treatments in Thiobarbituric acid during the storage period when adding lemongrass to raw beef patties. The increase in the percentage of free fatty acids in bird meat samples that were fed on diets with added lemongrass powder and stored by freezing for 45 days is due to the presence of lipolysis enzymes, such as Phospholipase and Lipase, which work to release free fatty acids that cause the unacceptable smell of meat [33] and confirm these The result was a high percentage of fatty acids in meat samples. The higher the percentage of unsaturated fatty acids in the meat, it leads to increased fat rancidity and ultimately reduces the storage time and increases the value of oxidation indicators in the meat [34], [35].

TABLE 4. Effect of lemongrass on oxidant indexes of broilers meat that stored in the freezer for forty-five days (mean \pm standard error).

Treatments Traits	T1	T2	T3
Peroxide value (Meq/Kg)	2.02 c \pm 0.02	2.95 b \pm 0.005	3.46 a \pm 0.008
Thiobarbituric acid (Mg-Malonedehyde/ Kg)	0.22 c \pm 0.01	0.29 b \pm 0.003	0.41 a \pm 0.005
Free Fatty Acids(%)	1.01 c \pm 0.01	2.19 b \pm 0.003	2.87 a \pm 0.003

T1- standard feed, T2 and T3 were standard feed added 1g and 2g of lemongrass powder/kg feed, respectively.
 - Different letters in the same row indicate significant differences among means of treatments ($P \leq 0.05$).

The percentage of all fatty acids such as Linoleic, oleic, Stearic, Palmitic and Linolenic were significantly increased ($P \leq 0.05$) in T2 and T3 compared with T1 (table V). The reason for the high concentrations of fatty acids in chicken meat fed on diets with added lemongrass powder is the role of this plant in increasing the efficiency of fatty acid absorption from the gastrointestinal tract [36], in addition to the fact that it contains oils containing fatty acids, which is reflected in its deposition in the meat [37], [38] indicated that the concentration of fatty acids in the meat is directly affected by the quality of the feed materials included in the composition of the diets. The increased concentrations of fatty acid in the meat during the storage period may be due to the occurrence of self-oxidation of these acids and the effectiveness of the lipase enzyme, which leads to the release of these acids from their sites in muscle fat [39].

TABLE 5. Effect of lemongrass on fatty acid of broilers meat (mean± standard error).

Treatments Traits	T1	T2	T3
Lenolic %	0.0088 c ± 0.0004	0.2063 a ± 0.0044	0.0346 b ± 0.0003
Oleic %	1.1438 c ± 0.1438	8.1153 a ± 0.0714	4.6226 b ± 0.0619
Stearic %	0.0147 c ± 0.1438	0.3841 a ± 0.0030	0.0847 b ± 0.0052
Palmetic %	1.1352 c ± 0.0023	6.0199 a ± 0.1906	3.9654 b ± 0.0327
Lenolinic %	0.0007 c ± 0.0001	0.0055 a ± 0.0002	0.0025 b ± 0.0002

T1- standard feed, T2 and T3 were standard feed added 1g and 2g of lemongrass powder/kg feed, respectively.
 - Different letters in the same row indicate significant differences among means of treatments ($P \leq 0.05$).

CONCLUSION

We conclude adding 2g of lemongrass powder per one kg of broiler diets improved most of the physical, chemical traits as well as fatty acids and of broilers meat but increased All oxidation indicators in storage meat.

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