



ISSN (E): 2277- 7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2021; SP-10(8): 674-680  
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[www.thepharmajournal.com](http://www.thepharmajournal.com)  
Received: 28-06-2021  
Accepted: 30-07-2021

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## Effect of dietary incorporation of lemon grass (*Cymbopogon flexuosus*) oil and turmeric (*Curcuma longa*) rhizome powder on growth performance, nutrient utilization, carcass characteristic and economic evaluation in commercial broiler chickens

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### Abstract

A feeding trial was conducted to discern the effect of dietary incorporation of lemon grass oil (*Cymbopogon flexuosus*) and turmeric rhizome powder (*Curcuma longa*) on growth performance, nutrient utilization, carcass traits in commercial broiler chickens. 120, (one day-old) broiler chicks were divided randomly into 4 treatment groups with 3 replicate each i.e. 10 broiler chicks per replicate. Chicks of treatment T<sub>1</sub> (control) were fed basal diet (starter and finisher diet), whereas in treatment groups T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub>, basal diet was incorporated with basal diet with 1ml/kg feed lemon grass oil + 0.25% turmeric rhizome powder, basal diet with 2ml/kg feed lemon grass oil + 0.25% turmeric rhizome powder, basal diet with 3ml/ kg feed lemon grass oil +0.25% turmeric rhizome powder respectively. Lemon grass oil and turmeric rhizome powder feeding resulted in increased in final body weight, weight gain and performance index in broilers chicken but the difference between treatment were not significant and economic valuations showed of the production was for basal diet fed group and groups incorporated with oil of lemongrass and turmeric rhizome powder and revealed no significant difference in the terms of feed cost per kg live weight gain (Rs) for the initial phase (0-3 weeks), finisher phase (3-6weeks) and overall (0-6 weeks). Therefore, it could be concluded that incorporation of lemon grass oil (*Cymbopogon flexuosus*) and turmeric rhizome powder (*Curcuma longa*) powder in the diets of commercial broiler chickens had no marked positive effect on their growth performance.

**Keywords:** lemon grass oil, turmeric rhizome powder, nutrient utilization, growth performance, commercial broiler chickens

### Introduction

In India, poultry sector has experienced an exemplary switch in structure and action of functioning from basic backyard rearing to major commercial agricultural based industry. Broiler industry is thought out be among the rapidly growing agro based industry in India. Number of poultry in India is 851.81 Million in 2019 (Livestock census, 2020) [10]. India was among top producing countries whose production has increased substantially and it reached about 217% (FAO, 2007). The contribution of poultry production in our country is about 0.66% its GDP and 7.72% GDP of the livestock sector. (Prabakaran, 2014; Rajenderan *et al.*, 2014) [23]. Due to rapid growth in poultry production the per capita availability for a year has also raised considerably and reached to 60 eggs and 2.5 Kg of meat.

Plants generate a wide range and types of organic compounds which are acquired from their secondary metabolism that are generally classified in three major groups: saponins, tannins, and essential oils. Essential oils are a mixtures of oily compounds aromatic in nature and which are abstracted from different part of the plants such as leaves, flowers, buds, seeds, fruits, twigs, bark, wood, and also their roots (Gopi *et al.*, 2014) [13]. These essential oils are aromatic hydrophobic liquids distilled generally by the process known as hydro distillation from a varying plant parts such as flowers, buds, seeds, leaves, twigs, bark, wood, fruits, receptacles and roots also (Zuzatae *et al.*, 2015). The mechanisms of action of essential oil by which essential oil functions are relying on their chemical constituents and also the location and position of one or more active functional groups. Membrane damage is considered as the main mechanism of action of essential oil (Lve *et al.*, 2011) [16].

Essential oil from lemon grass (*Cymbopogon flexuosus*) is taken from the leaves of the plant by a process known as hydro distillation. Citral is the vital component in oil of lemon grass it is

accountable for the peculiar lemon like aroma. Because of various well-known medicinal properties in many popular culture especially antimicrobial activity these oils has been in use since eternal (Adukwu *et al.*, 2012; Dasai and Parekh, 2012) [1]. The oil from lemon grass is as remedy for treating intestinal worms, anemia, bacterial and viral infections and also used for the manufacturing of different pesticides, perfumes, cosmetics and pharmaceuticals (Russo, 1992) [27]. Many experiments have shown pragmatic outcome of dietary oil of lemon grass supplementation on average body weight gain. Supplementation of dietary oil of lemon grass in feed can enhance the average growth performance of broilers (Bampidis *et al.*, 2005; Mukhtar *et al.*, 2012) [5, 19].

Turmeric is a considered to be perennial plant of Zingiberaceae family. Turmeric Rhizome is a considerably used as spice, colouring agent and food preservative which has many biological actions and medicinal applications. Powdered turmeric rhizome has antioxidant, anti-inflammatory, antibacterial, antihypertensive and hypocholesterolemic properties (Chattopadhyaya *et al.*, 2004) [9]. These properties are due to presence of phytochemicals such as curcmins, demethoxycurcumin, tetrahydro-curcumin, curcuminoids, arturmerone, zingiberene, turmirone and curlone (Burt, 2004) [8]. Powdered Turmeric rhizome also has the potential to increase the secrete of various enzymes of the alimentary system alike amylase, pancreatic lipase, trypsin, and chymotrypsin (Patel and Srinevasan, 2000) [22]. Soni *et al.* (1997) [30] observed the protective action of turmeric investigated mutagenicity and hepato-carcinogenicity induced by aflatoxins. Turmeric has many antioxidants and used in the cooking in Asian and African cuisine. Studies have found that to safeguard adequate antioxidant properties it is important to consume adequate proportions of turmeric from soups *in vivo* (Tilak *et al.*, 2004) [31].

Presently there is very less information available about feeding of lemon grass oil and turmeric rhizome powder as feed additives in commercial broiler chickens. Though both of these feed additives have been fed separately in various experiments, but information about combined feeding of these feed additives and /or feed ingredients is not available. Therefore the objective of the present study was to investigate the effect of powder of turmeric rhizome and lemon grass oil on feed intake, growth performance, carcass characteristics and economics evaluation in commercial broiler chickens.

### Materials and Methods:

A total of 120, day-old commercial broiler chicks were procured and randomly divided into four treatment groups with 3 replication having 10 chicks in each in a completely randomized design. First group was given basal diet, second group was given basal diet with 1ml/kg feed lemon grass oil + 0.25% turmeric rhizome powder while third group was given basal diet with 2ml/kg feed lemon grass oil + 0.25% turmeric rhizome powder and fourth group was given basal diet with 3ml/ kg feed lemon grass oil + 0.25% turmeric rhizome powder respectively. The feeding trial lasted for 42 days viz., 0-21 days (starter phase) and 21-42 days (finisher phase). The ingredient compositions of diets are presented in Table 1.

### Procurement of lemon grass oil and turmeric rhizome powder

Turmeric rhizome bought from Pantnagar shopping complex and stored under ambient temperature. After this the required amount of the turmeric rhizome was weighed with weighing

machine and grounded in mixer to convert it into powder of smaller particle size. Lemongrass oil bought from CSIR-CIMAP Research Center Pantnagar Uttarakhand.

### Growth performance parameters

Daily record of feed offered to birds of different treatment groups was maintained. The birds from each replicate were weighed individually at weekly basis. The body weight gain, feed conversion ratio and performance index were calculated.

### Analysis of feed, meat and excreta samples

The representative samples of experimental broiler starter and finisher feeds as well as excreta obtained during metabolism trial and representative meat samples from breast and thigh were collected and proximate analysis was conducted on the samples collected, using the standard principles (AOAC, 2000) [3].

### Carcass traits

For the carcass trait studies, two representative broiler chickens from each replicate of all treatment groups was sacrificed at the end of feeding cum growth trial for evaluation of carcass characteristics.

### Economics Evaluation

The values for the economics by the incorporation of lemon grass oil and turmeric rhizome powder during 0 to 21, 21 to 42 and 0 to 42 days.

### Statistical analysis

The experimental data obtained in the present study were analyzed statistically (Snedecor and Cochran, 1994) [29] by using general linear model procedure. Difference between treatments means were compared using Duncan's multiple range test (Kramer, 1957) [15].

### Results and Discussion

#### Growth performance

Growth performance of broiler chicks fed the experimental diets is shown in Table 2, 3 and 4. During the starter phase, dietary lemon grass oil and turmeric rhizome powder, incorporation in the diet of broiler chicks influenced the body weight and body weight gain, feed intake, feed conversion ratio and performance index. During the finisher phase, incorporation of lemon grass oil and turmeric rhizome powder in the diet of broiler chicks influenced the body weight, body weight gain and performance index but did not show significant effect on feed intake and feed conversion ratio. The average body weight gain of broiler chickens during whole feeding trail was 1778.60, 1799.90, 1743.10 and 1744.10g in treatment groups T1, T2, T3 and T4, respectively. Maximum average weight gain was in T2 followed by T1, T4 and T3. But the values did not differ significantly among the different treatment groups. The average feed intake for the entire rearing phase was 3954.40, 3569.20, 3616.10 and 3550.60 g for T1, T2, T3 and T4 treatment groups respectively. It was seen that incorporation of lemon grass oil and turmeric rhizome powder found to reduce the feed intake in the treatment groups compared to the control group but the values did not differ significantly. The feed conversion ratio (FCR) for T1, T2, T3 and T4 dietary treatment was found to be 2.23, 1.98, 2.07 and 2.03. It was recorded that incorporation of lemon grass oil and turmeric rhizome powder improved the FCR and most efficient value was be recorded

in T2 followed by T4, T3 and T1 groups but the values were found to be statistically similar. The values for performance index for T1, T2, T3 and T4 treatments was observed to be 810.66, 911.13, 840.40 and 856.90 respectively. There was an improvement in performance index by the incorporation of lemon grass oil and turmeric rhizome powder compared to the control group, with maximum value in T2 group followed by T4, T3 and T1 but the values were found to be statistically similar.

The growth performance of the commercial broiler chickens in the terms of average weight gain, average feed intake, feed conversion ratio, performance index by the incorporation of lemon grass oil and turmeric rhizome powder did not show any significant difference compared to the control group, which are relevant to the studies by Tiwari *et al.* (2017) [32] and Azevedo *et al.* (2017) [4] who reported that incorporation of lemon grass oil in the diet of broiler chickens did not significantly improve the growth performance of the broiler chickens. Mmereloe. (2010) [18] observed that the supplementation of 1% lemon grass leaf to broiler chickens diets did not affected feed consumption. Pappas *et al.* (2011) and Bozkurt *et al.* (2012) [21, 7] noted that essential oil and organic acid combination showed no significant improvement on the growth performance of broiler chickens and feed intake. Incorporation of turmeric rhizome powder did not affect the performance of commercial broiler chickens (Ratika *et al.*, 2018, and Wang *et al.*, 2015) [25, 33]. Whereas an improvement in the performance by turmeric incorporation in the diets of broiler chickens (Sethy *et al.*, 2016) [28] was also noticed.

#### Nutrient utilization

Feeding broilers on diet supplemented with lemon grass oil and turmeric rhizome powder had no significant affect on nutrient utilization as shown in Table 5.

This is in agreement with Hernandez *et al.* (2004) [14] also reported non-significant effect on the nutrient utilization by the incorporation of cinnamon, pepper and oregano oil blend in the starter phase.

#### Carcass characteristics

Average dressing percentage, carcass yield, cut up parts, organ weight and processing losses of commercial broiler chickens of different treatment groups was not significantly differ due to supplementation of lemon grass oil and turmeric rhizome powder in the diets as shown in Table 6. Also there was no significant difference found in the cut up parts and organs weight of the treatment birds (Table 7). These results are in agreement with Azevedo *et al.* (2017) [4] and Tiwari *et al.* (2017) [32] revealed similar results. Also essential oil of citrus peel of bergamot, lemon and orange in the diets of the broiler chickens also revealed no significant effect on the carcass yield or weight of heart liver, pancreas, large intestine and small intestine of broiler chickens (Erhan and Bolukbasi. 2017) [12]. However contrary to the present study Nogueira *et al.* (2017) observed that lemon grass oil fed birds had lower drum stick and gizzard weight. The inclusion of lemon grass negatively affected the commercial cuts. Reddy *et al.* (2012) noted that the incorporation of powdered turmeric @ 0.25% and 0.5% in the diet of broiler chickens did not influence the carcass traits of the birds. Similar results were revealed by Mehala *et al.* (2011) [17].

#### Meat composition

Dietary supplementation of lemon grass oil and turmeric rhizome powder significantly ( $P \leq 0.05$ ) decrease the ether extract content of both breast and thigh muscles as shown in Table 8. Significantly ( $P \leq 0.05$ ) lower ether extract content was found in T3 group. The crude protein value noted as 81.99, 82.09, 81.47 and 82.07 % on DM basis for T1, T2, T3 and T4 treatments respectively. This result agreed with the findings of Al Sultan (2003) [2] and Ratika (2014) indicated that incorporation of turmeric rhizome powder and garlic powder was found to have no effect on the protein content of the thigh and breast muscle.

#### Sensory characteristics

##### Appearance

The appearance of meat of broiler chicken of different dietary treatments was statistically similar due to the incorporation of lemon grass oil and turmeric rhizome powder. (Table 9). Values observed was 6.80, 6.90, 7.10 and 7.00 as measured by 8-point hedonic scale for T1, T2, T3 and T4 treatments respectively. The highest value was noted in T3 treatment group.

##### Flavor

The flavor of broiler chicken meat was not affected by the dietary incorporation of lemon grass oil and turmeric rhizome powder. As measured by 8-point hedonic scale the values for flavor were noted to be 6.60, 6.40, 7.00 and 6.90 for T1, T2, T3 and T4 treatments respectively. The highest value was noted in T3 treatment group.

##### Juiciness

The juiciness of broiler chicken meat for different dietary treatment showed no significant difference by the incorporation of lemon grass oil and turmeric rhizome powder. The juiciness values were noted as 6.30, 6.30, 6.60 and 6.70 as measured by 8-point hedonic scale for T1, T2, T3 and T4 treatments respectively. The highest value was noted in T4 treatment group.

##### Texture

The texture of the broiler chicken meat did not vary significantly among the different dietary treatment with the incorporation of lemon grass oil and turmeric rhizome powder. As measured by 8-point hedonic scale the values noted was 6.80, 6.60, 7.30 and 7.10 as measured by 8-point hedonic scale for T1, T2, T3 and T4 treatment groups respectively. The highest value noted in T3 group.

##### Overall acceptability

The overall acceptability of the broiler meat did not differ significantly ( $P > 0.05$ ) between the groups incorporated with lemon grass oil and turmeric rhizome powder. The values noted were found to be 6.84, 6.80, 6.90 and 6.94 as measured by 8-point hedonic scale for T1, T2, T3 and T4 treatments respectively with highest value noted in T4 treatment group.

The results of current study are relevant to study by Al-Sultan (2003) [2] who reported that incorporation of turmeric rhizome powder in the diet of the poultry birds @0.25%, 0.5% and 1% had no effect on the sensory characteristics of the meat. Similarly Symeon *et al.* (2009) demonstrated that two concentrations of oregano essential oil (100 or 250 mg/kg) in the feed did not alter the acceptance profile (tenderness, juiciness, taste, overall acceptance).

### Economics Evaluation

The total cost (Rs/kg) noted for T1, T2, T3 and T4 treatment was 130.13, 122.62, 132.50 and 129.69 respectively. The feed cost per kg weight gain was noted to be 73.20, 68.20, 76.09 and 74.37 rupees for T1, T2, T3 and T4 treatment respectively (Table 10).

There was no significant difference observed between the

values of different groups. The results of the study are relevant to the study by Mukhtar *et al.* (2012) [19] who revealed that incorporation lemon grass leaf meal to the quail did not improve performance and revenue as compared to the control group. The reason for this may be due to the cost and supplementation of lemon grass meal.

**Table 1:** Ingredient composition (%) of broiler chicks (Starter and Finisher) basal diets (kg/100kg)

Ingredients (%)	Broiler starter (0 -3 weeks)	Broiler finisher (3 – 6 weeks)
Maize	53.0	56.0
Rice polish	04.0	06.0
Deoiled soyabean meal	30.0	25.0
Groundnut cake	10.0	08.0
Vegetable oil	0.725	2.325
Lysine	0.20	0.20
DL-methionine	0.30	0.30
Dicalcium phosphate	01.00	1.40
Trace mineral mixture	0.25	0.25
Common salt	0.30	0.30
Vitamin premix	0.025	0.025
Coccidiostat	0.05	0.05
Hepatocare	0.10	0.10
Choline chloride	0.05	0.05
Total	100.00	100.00

**Table 2:** Average growth performance of commercial broiler chicks from 0-21 days fed diets incorporated with lemon grass oil and turmeric rhizome powder

Parameters	Treatments				SEm	P-value
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>		
Initial body weight (g)	47.10±0.00	47.10±0.10	47.23±0.03	47.23±0.12	0.079	0.471
Body weight at 21 <sup>st</sup> day (g)	397.28±23.79	397.47±15.61	412.78±9.82	404.22±15.0	16.854	0.901
Weight gain (g)	350.18±23.79	350.37±15.70	365.54±9.79	356.99±15.04	16.847	0.904
Feed intake (g)	678.47±8.84	628.91±30.77	646.20±37.17	630.60±31.34	29.106	0.620
Feed conversion ratio	1.95±0.11	1.80±0.12	1.76±0.06	1.77±0.03	0.093	0.474
Performance index	181.85±22.16	196.99±19.61	207.38±6.31	202.30±9.34	15.838	0.702

T1: basal diet; T2: basal diet incorporated with lemon grass oil @ 1ml/kg feed + 0.25% turmeric rhizome powder; T3: basal diet incorporated with lemon grass oil @ 2ml/kg feed +0.25% turmeric rhizome powder and T4: basal diet incorporated with lemon grass oil @ 3ml/kg of feed and 0.25% turmeric rhizome powder.

**Table 3:** Average growth performance of commercial broiler chicks from 21-42 days fed diets incorporated with lemon grass oil and turmeric rhizome powder

Parameters	Treatments				SEm	P- value
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>		
Body weight at 21 <sup>st</sup> day	397.28±23.79	397.33±15.73	412.78±9.82	404.22±15.15	16.881	0.901
Body weight at 42 <sup>nd</sup> day (g)	1837.70±86.68	1847.00±41.32	1790.30±50.80	1791.30±11.40	54.619	0.824
Weight gain (g)	1440.4±80.98	1449.7±31.25	1377.6±45.05	1387.1±22.12	50.134	0.672
Feed intake (g)	3275.80±195.9	2940.30±100.6	3059.60±88.20	2859.70±42.57	120.531	0.159
Feed conversion ratio	2.30±0.26	2.03±0.09	2.22±0.09	2.06±0.06	0.147	0.540
Performance index	647.55±96.26	717.58±44.78	622.05±39.58	673.87±29.04	58.485	0.701

**Table 4:** Average growth performance of commercial broiler chicks from 0-42 days fed diets incorporated with lemon grass oil and turmeric rhizome powder

Parameters	Treatments				SEm	P-value
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>		
Initial body weight (g)	47.10±0.00	47.10±0.10	47.23±0.03	47.23±0.12	0.0795	0.471
Body weight at 42 <sup>nd</sup> day (g)	1825.70±76.82	1847.00±41.32	1790.30±50.80	1791.30±11.40	50.796	0.827
Weight gain (g)	1778.60±76.82	1799.90±41.42	1743.10±50.80	1744.10±11.39	50.815	0.826
Feed intake (g)	3954.40±203.03	3569.20±123.24	3616.10±123.53	3550.60±13.55	134.031	0.192
Feed conversion ratio	2.23±0.19	1.98±0.08	2.07±0.020	2.03±0.02	0.106	0.421
Performance index	810.66±92.84	911.13±56.37	840.40±22.73	856.90±14.31	55.948	0.651

**Table 5:** Average nutrient utilization (%) in commercial broiler chickens fed diets incorporated with lemon grass oil and turmeric rhizome powder

Parameters	Treatments				SEm	P-value
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>		
Dry matter	69.51±1.22	70.40±1.53	72.65±1.52	70.05±0.86	10.413	0.353
Organic matter	71.54±1.17	71.72±1.49	73.97±1.42	72.30±0.72	104.084	0.539
Crude protein	78.47±1.94	76.07±4.07	78.34±2.55	79.34±3.33	57.336	0.890
Ether extract	73.93±5.07	74.10±3.89	73.60±3.36	74.81±4.13	9.263	0.997

**Table 6:** Average values for dressing percentage and carcass yield (% live weight) of finisher commercial broilers fed diets incorporated with lemon grass oil and turmeric rhizome powder

Parameters	Treatments				SEm	P-value
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>		
Dressing %	59.47±0.86	60.58±0.81	60.58±0.91	61.80±1.10	0.931	0.395
Carcass yield	68.39±0.84	69.95±0.90	69.74±1.14	71.41±1.10	1.009	0.247

**Table 7:** Average values of cut-up parts of finisher commercial broilers chickens (% live weight) fed diets incorporated with lemon grass oil and turmeric rhizome powder

Parameters	Treatments				SEm	P-value
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>		
Neck	3.34±0.19	3.59±0.32	3.42±0.21	3.60±0.05	0.216	0.784
Wing	7.27±0.21	7.42±0.14	7.20±0.24	7.12±0.15	0.196	0.745
Back	10.37±0.52	10.19±0.30	10.23±0.29	10.21±0.35	0.379	0.986
Breast	18.16±0.73	17.86±0.61	18.66±0.83	18.12±0.53	0.685	0.869
Thigh	9.51±0.11	9.54±0.15	9.43±0.26	9.57±0.31	0.225	0.094
Heart	0.79±0.031	0.75±0.034	0.75±0.04	0.79±0.033	0.036	0.725
Liver	2.29±0.10	2.32±0.12	2.21±0.11	2.23±0.12	0.118	0.916
Blood	3.58±0.28	3.65±0.67	4.38±0.24	4.17±0.94	0.609	0.745
Abdominal fat	1.65±0.21	1.68±0.23	1.47±0.19	1.55±0.12	0.197	0.880

**Table 8:** Average values of meat composition (on DM basis) of commercial broiler chickens fed diets incorporated with lemon grass oil and turmeric rhizome powder

Parameters	Treatment <sup>a</sup>				SEm	P-value
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>		
<b>Breast muscle</b>						
Crude protein (%)	81.99±1.64	82.09±2.49	81.47±1.33	82.07±0.79	1.681	0.993
Ether extract (%)	12.08±0.47	12.42±1.12	11.58±0.41	12.16±0.62	0.718	0.870
Ash (%)	3.76±0.40	3.83±0.48	3.92±0.39	3.67±0.42	0.426	0.979
<b>Thigh muscle</b>						
Crude protein (%)	72.56±2.02	72.32±2.75	73.27±3.9	73.19±3.05	3.020	0.976
Ether extract (%)	21.16±1.75	20.41±2.46	20.08±1.09	21.00±2.13	1.932	0.995
Ash (%)	4.83±0.16	5.08±0.37	4.91±0.32	4.75±0.38	0.324	0.900

**Table 9:** Average values for sensory characteristics of meat of broilers fed diets incorporated with lemon grass oil and turmeric rhizome powder

Parameters	Treatments				SEm	P-value
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>		
Appearance/colour	6.80±0.20	6.90±0.10	7.10±0.24	7.00±0.00	0.151	0.621
Flavour	6.60±0.29	6.40±0.24	7.00±0.00	6.90±0.24	0.206	0.258
Juiciness	6.30±0.20	6.30±0.20	6.60±0.24	6.70±0.20	0.193	0.442
Texture	6.80±0.20	6.60±0.24	7.30±0.20	7.10±0.24	0.204	0.165
Overall acceptability	6.84±0.24	6.80±0.12	6.90±0.24	6.94±0.16	0.205	0.962

<sup>a</sup>T<sub>1</sub>: Basal diet; T<sub>2</sub>: basal diet incorporated with lemon grass oil @ 1ml/kg feed + 0.25% turmeric rhizome powder; T<sub>3</sub>: basal diet incorporated with lemon grass oil @ 2ml/kg feed +0.25% turmeric rhizome powder and T<sub>4</sub>: basal diet incorporated with lemon grass oil @3ml/kg of feed +0.25% turmeric rhizome powder.

**Table 10:** Economics for commercial broiler chickens fed diets incorporated with lemon grass oil and turmeric rhizome powder (0-42 Days)

Parameters	Treatments				SEm	P-value
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>		
<b>0-42 Days</b>						
Average body weight gain (g)	1790.6±86.68	1800.0±41.29	1743.1±50.80	1744.1±11.39	24.577	0.822
Average feed intake (g)	3954.3±2.03a	3569.2±1.23ab	3705.8±87.68ab	3490.3±67.10b	77.05	0.142
Total feed cost (Rs.)	130.15±6.67	123.37±4.26	133.28±3.15	130.42±2.50	4.443	0.485
Feed cost/ Kg weight gain (Rs.)	73.21±6.52	68.61±2.91	76.54±2.17	74.79±1.68	3.825	0.533

T<sub>1</sub>: Basal diet; T<sub>2</sub>: basal diet incorporated with lemon grass oil @ 1ml/kg feed + 0.25% turmeric rhizome powder; T<sub>3</sub>: basal diet incorporated with lemon grass oil @ 2ml/kg feed +0.25% turmeric rhizome powder and T<sub>4</sub>: basal diet incorporated with lemon grass oil @3ml/kg of feed +0.25% turmeric rhizome powder

## Conclusion

It could be concluded that incorporation of oil of lemongrass and powdered turmeric rhizome in the feed of commercial chickens had no marked positive action on the performance in terms of growth, utilization of nutrients, carcass characteristics and economic evaluation.

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