



## RESEARCH PAPER

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## Lemon grass (*Cymbopogon citratus*, LG) powder as a feed supplement for broiler

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### Abstract

Supplementation of lemon grass powder significantly affected feed consumption; however, comparable performance was noted on final weight, total gain in weight, feed conversion ratio, dressing percentage, percent leaf fat, and survival rate of broilers. The profit above feed, medicine, and stock cost of broilers was found comparable. Lemon grass powder at a rate of 1 to 3% can be used as a feed supplement as a substitute for commercial antibiotics.

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## Introduction

Feed additives are products used in animal nutrition to improve the efficiency of feed utilization and reduce the high cost of feed. Plant origin like herbs, spices or any plant extract can be considered as an alternative or replacement to antibiotics as a growth enhancer in improving chicken performance. Herb is defined as any plant with leaves, flowers, or seeds that is used for food, flavoring, or perfume and has medicinal properties. As mentioned by Dhama, 2014, medicinal herbs that have been studied as replacements for microbial and growth-promoting abilities in poultry provided positive results in production at minimized expenses.

According to Shah *et al.* (2011) lemon grass (*Cymbopogon citratus*, LG) contains flavonoids, phenolic compounds, terpenoids, and essential oils (such as citral  $\alpha$ , citral  $\beta$ , geraniol, citronellal, terpinolene, geranyl acetate, myrcene and terpinol methylheptenone) which may have various biological activities such as antibacterial, antidiarrheal, antifungal, antioxidants, and as a growth promoter. An invention of lemon grass powder was made by Badr (WO2019074663A2) that includes the composition, methods of making, and methods of treating or reducing digestive problems. Further, lemon grass leaves and stems are very good in folic acid content. Lemon grass herb parts, whether fresh or dried are rich sources of minerals like potassium, zinc, calcium, iron, manganese, copper, and magnesium. Fresh lemon grass also contains vitamins such as vitamin C and vitamin A and small amounts of anti-oxidant. Lemon grass decoction and essential oil extracts contain bio compounds, non-toxic and non-mutagenic (Olorunnisola *et al.*, 2014). However, according to Abaza (2001), although good results were obtained with these substances, their use might have unfavorable effects such as the production of residual problems in the tissues of birds and animals.

Lemongrass (*Cymbopogon citratus*) is an ingenious herb with a natural aroma, considered as mosquito repellent and used in the gardens as decorations. Lemongrass belongs to the family Poaceae (formerly

known as Gramineae) (Herbs, 2000). The major chemical ingredient found in all varieties of essential oils of lemongrass is citral or lemonal and 1 to 2% essential oil on a dry basis (Aziz, 2011). Linear leaf blade, can grow to a length of 50 cm, 1.5 cm in width (Tajidin *et al.*, 2012). The therapeutic properties credited to lemon grass are: analgesic, anti-depressant, antimicrobial, antipyretic, antiseptic, bactericidal, diuretic, fungicidal, insecticidal, nervous system sedative and tonic (Mmereole, 2010). Other uncommon component of lemon grass includes limonene, citronella,  $\beta$ -myrcene and geraniol. Lemon Grass also contains flavonoids, anthraquinones, alkaloids, saponins, tannins, steroids, phenols and (Nambiar *et al.*, 2012). Its leaves and stem are very good in folic acid content; 100 g leaves and stem provide about 75  $\mu$ g or 19% of RDA. Fresh or dried lemon grass are rich sources of minerals like magnesium, potassium, copper, zinc, calcium, iron and manganese. It also contains small amounts of anti-oxidant, vitamins such as vitamin C and vitamin A. Lemon grass decoction and essential oil extracts contain bio compounds, non-toxic and non-mutagenic (Olorunnisola *et al.*, 2014).

Literatures provided contradicting results on the use of lemon grass as feed supplement/additive. There are some research studies on the use of lemon grass or its secondary metabolites for performance enhancing particularly of chickens (Mmereole, 2010; Mukhtar *et al.*, 2012; Thayalini *et al.*, 2011). Mmereole (2010) and Mukhtar *et al.* (2012) confirmed in their study that lemon grass could be a replacement to antibiotics. In contrast, Thayalini *et al.* (2011) declared that lemon grass did not improve or decreased the growth performance.

The inclusion of lemon grass at a rate of 400 ml/100 kg feed improved the production performance of broilers (Tiwari *et al.*, 2019). In contrast, Mmereole (2010) found that the dietary inclusion of lemon grass leaves did not affect the growth performance of birds in terms of final body weight and feed conversion rate but significantly affected the mortality rate. Similarly, with the findings of Alzawqari *et al.* (2016) that

addition of lemon grass as feed additives to broilers did not significantly affected the gain in weight, feed consumption and feed conversion rate including the carcass characteristics in broilers. Several researchers however, (Tiwari *et al.*, 2018; Mmereole, 2010; Giridharrao, 2015; Poorghasemi *et al.*, 2017) cited that lemongrass can be considered as alternative to antibiotics as growth promoters in bird's diets for improving production performance. Lemon grass in the form of decoction, extract, and powder was used as a feed supplement that was added to the drinking water and feeds instead of using synthetic growth enhancers that can cause an accumulation of residues in animals in meat (Ronquillo *et al.*, 2017).

In this project, different preparations of lemon grass were evaluated as growth promoters in broilers used as a supplement in drinking water and as a feed additive.

### Materials and methods

A total of 160 head day-old broiler chicks were distributed at random in four treatments replicated four times following the Randomized Complete Block Design. The treatments used are as follows:

To – Pure commercial feeds + electrolytes in drinking water (Control)

T1 – 1% Lemon grass powder

T2 – 2% Lemon grass powder

T3 - 3% Lemon grass powder

a. Preparation of lemon grass powder: Lemon grass was chopped into small pieces and air-dried for 10 days. After drying, it was ground into powder and stored in a polyethylene bag.

Lemon grass powder was added to the commercial ration of broilers following the amount specific in each treatment. The experimental rations were given to the birds from brooding until 35 days old. Birds in the control group were given commercial feeds alone and provided with electrolytes containing niacinamide, magnesium chloride, potassium chloride, sodium acetate, sodium chloride, and glucose for 21 days in their drinking water instead.

b. Preparation of experimental cages and management practices: The experimental area including cages, and poultry equipment was cleaned with soap and water followed by disinfection to prevent the growth and multiplication of disease-causing microorganisms. Cages were left for seven days to eliminate the odor. The cages were installed with electric bulbs as a source of heat during the two weeks of brooding period. The sides of the cages were covered with clean empty sacks to maintain the proper temperature and to prevent the birds from exposure to draft while the floors were placed with rice hull as beddings which were changed every other day. Strict hygiene and sanitation were properly imposed and observed throughout the experiment.

*Ad libitum* feeding was employed in all treatments from brooding to 35 days old. Chick booster was given to the birds during the brooding period and was shifted to the starter ration thereafter. Mortality rate was noted from brooding to growing period.

### Data gathered

Initial weight (kg): This was taken by weighing the birds at day old before placing them in their respective cages.

Final weight (kg): This was taken by weighing the bird at 35 days old.

Gain in weight (kg): This was taken by subtracting the initial weight of birds from the final weight.

Feed consumption (kg): This was obtained by summing up the daily feed intake of broilers from a day old to 35 days old.

Water consumption (li): This was taken by summing up the total amount of water consumed from brooding to 35 days of age.

Dressing percentage (%): This was obtained by dividing the dressed weight by the birds live weight, multiplied by 100.

Feed conversion ratio: This was computed by dividing the total amount of feed consumed by the total gain in weight.

Profit above feed, supplement, and stock cost (P): This was taken by subtracting the cost of feed, medicine, and stock cost from the sale value of birds at the end of the study.

#### Data analysis

The data gathered were analyzed using the Analysis of Variance in Randomized Complete Block Design, and differences among treatment means were further tested using Tukeys's Honest Significant Difference (HSD) Test.

### Results and discussion

#### Growth performance of broilers

The growth performance of broilers in terms of final weight, gain in weight, feed consumption, and feed

conversion ratio as affected by lemon grass powder is shown in Table 1.

The final weight of birds as affected by lemon grass powder is presented in Table 1. It is noted that the final weight of broilers ranges from 1.51 kg to 1.57 kg. Birds given 1% lemon grass and those given commercial feeds had the least final weight. Birds with three percent lemongrass powder had the maximum final weight. The analysis of variance revealed no significant results.

Thus, the different levels of lemon grass powder including the control which was given electrolytes in drinking water have a comparable influence on the final weight of broilers. The present result is similar to the study of Mmereole (2010) in that supplementation of lemon grass meal added to birds' diet did not affect the performance in terms of final weight, gain in weight, and feed conversion ratio.

**Table 1.** Final weight, gain in weight, feed consumption, and feed conversion ratio of broilers as affected by lemon grass powder

Treatment	Final weight (kg)	Gain in weight (kg)	Feed consumption(kg)	FCR
Pure commercial feeds	1.52	1.48	2.52 <sup>a</sup>	1.69
1% lemon grass powder	1.51	1.47	2.48 <sup>ab</sup>	1.70
2% lemon grass powder	1.56	1.52	2.49 <sup>ab</sup>	1.64
3% lemon grass powder	1.57	1.53	2.45 <sup>b</sup>	1.57
Significance	ns	ns	**	ns
cv	3.82%	3.93%	1.19%	4.17%

\*\* All means within a column followed by the same letter are not significantly different at 0.01 level (Tukeys's HSD Test)

**Table 2.** Survival rate, dressing percentage, and percent leaf fat of broilers as affected by different levels of lemon grass powder as feed supplement (%)

Treatment	Survival rate (%)	Dressing percentage (%)	Percent leaf fat (%)
Pure commercial feeds	3.75	71.28	4.0
1% lemon grass powder	2.50	70.29	4.0
2% lemon grass powder	2.50	68.56	3.0
3% lemon grass powder	2.50	71.18	3.0
Significance	ns	ns	ns
cv	111.85%	2.36%	13.25%

The gain in weight of birds was also found comparable which ranged from 1.47 kg to 1.53 kg (Table 1). The result implies that the phytobiotics present in herbal plants did not exert a significant positive response on the total gain in weight of broilers. As cited by Zariozkan (2018) the supplementation of lemon grass leaf meal on

the gain in weight of quail given 1.5% level did not affect the gain in weight, however, decreased live weight giving 3% supplementation.

The mean feed consumption of birds is presented in Table 1. The result shows that those birds given

pure commercial feeds consumed the most (2.52 kg) but did not differ significantly with birds supplemented with 1% to 2% lemon grass powder while those birds supplemented with 3% lemon grass powder consumed the least (2.45 kg) which differed from the rest with high significance. The result implies that the supplementation of 3% lemon grass powder caused a reduction in the feed consumption of birds without affecting the final weight and gain in weight.

A similar result was reported by Aroche *et al.* (2018) where the dietary inclusion of 0.5% of herbal leaves decreased the feed intake of broilers but obtained better growth performance of birds. Phytogetic compounds have been reported to have better potential for growth, activate digestive enzymes, and stimulate immune function.

The feed conversion ratio ranges from 1.57 to 1.70. The analysis of variance revealed insignificant results suggesting that supplementation of different levels of lemon grass powder did not cause significant variation in feed conversion ratio and was comparable to control. The result of the study is similar to the study of Mmereole (2010) in that the addition of dietary lemon grass and its ability to be utilized as a substitute to commercial growth promoters was found comparable in terms of feed conversion ratio.

The survival rate of broilers given lemon grass powder as a supplement ranges from 2.50-3.75%. The analysis of variance did not show significant differences (Table 2).

The dressing percentage of broilers ranges from 68.56% to 71.28%. The analysis of variance revealed no significant result. The result implies that supplementation with different levels of lemon grass powder had comparable dressing percentage as to the control birds. Dressing percentage is a trait of economic importance and the higher the dressing percentage the better the economic returns (Karthivashan *et al.*, 2015).

The carcass characteristics as reflected by leaf fat range from 3% to 4%. Analysis of variance revealed no significant results. The result implies that supplementation of lemon grass powder did not affect the percent leaf fat of birds. The present result is in contradicts the study of Emadi and Kermanshasi (2006) that significant decrease in abdominal fat percentage by the addition of 0.25%, 0.5%, and 0.75% of turmeric powder in broiler rations.

**Table 3.** Profit above feed, medicine, and stock cost of broilers as affected by different levels of lemon grass powder as feed supplement for broilers (PhP)

Treatment	Profit (PhP)
Commercial feeds	21.22
1% lemon grass powder	17.67
2% lemon grass powder	17.23
3% lemon grass powder	26.22
Significance	ns
cv	27.58%

Table 3 shows the profit above feed, medicine, and stock costs of broilers as affected by different levels of lemon grass powder. The result shows that the profit of broilers ranges from PhP 17.23 to 26.22. Analysis of variance showed no significant results. The result implies further that the production of broilers given different levels of lemon grass powder resulted in comparable mean profit based on the dress weight of broilers. As cited by Wallace *et al.* (2010) in their article, bioactive components or secondary metabolites of dietary plants added to the birds' diet can be efficient in controlling diseases, and improving livestock production as well as the quality of the products.

### Conclusion

The growth performance of broilers as affected by lemon grass significantly affected the feed consumption, however: comparable performance was noted on final weight, total gain in weight, feed conversion ratio, dressing percentage, percent leaf fat, and survival rate of broilers. The profit above feed, medicine, and stock cost of broilers was found comparable.

### Recommendation(s)

Lemon grass powder at a rate of 1 to 3% can be used as a feed supplement as a substitute for commercial antibiotics.

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