



Licorice Root Powder, Asparagus Root Powder and Lemongrass Oil in Broilers Diet

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## Synergistic Effect of Licorice (*Glycyrrhiza glabra*) Root Powder, Asparagus (*Asparagus racemosus*) Root Powder and Lemongrass (*Cymbopogon citratus*) Oil on the Growth Performance of Commercial Broiler Chicken

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### ABSTRACT

The present study was conducted to evaluate the synergistic effect of licorice root powder (LRP), asparagus root powder (ARP) and lemongrass oil (LGO) on the performance of broiler chickens. A total of 300-day-old commercial male broiler chicks (Vencobb 400) were randomly distributed into six treatments having ten replicates with five birds in each replicate and were raised for a period of 42 days. Diets contain T1 as control i.e. basal diet (BD) without any growth promoter, T2 – 0.05% antibiotic (AB), T3 – 1% LRP + 2% ARP, T4 -1% LRP + 250mg LGO, T5 – 2% ARP + 250mg LGO and T6 – 1% LRP + 2% ARP + 250mg LGO. Results revealed that significantly ( $P<0.05$ ) increased body weight gain and better feed conversion ratio was noticed in LRP + LGO combination group followed by other combinations and antibiotic when compared to control at 42 d of age. No significant effect was noticed in feed consumption by different treatments. Therefore, it can be concluded that supplementation of licorice root powder (1%), asparagus root powder (2%) and lemongrass oil (250mg) combination were found to be beneficial in broiler chicken for its remarkable results in terms of growth performance and can be a better alternative to antibiotic growth promoter.

**KEYWORDS:** Antibiotic, Asparagus, Broilers diet, Lemongrass Oil, Licorice

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### INTRODUCTION

Phytobiotics, are extracts/metabolites that are derived from plants, herbs and spices, and are used as good alternatives to antibiotic growth promoters in broilers and are known for their positive effects on growth, improved immune system and reduced stress response (Frankic et al., 2009; Ghasemi et al., 2014; Toghyani et al., 2011; Windisch et al., 2008). Licorice (*Glycyrrhiza glabra*) is a perennial herb with glycyrrhizic acid and flavonoids as main active substances which has been reported to have immunomodulatory, antimicrobial, antioxidative, anti-inflammatory, antidiabetic, hepatoprotective, antiviral and anti-infective properties (Damle, 2014). *Asparagus racemosus* is one of most commonly used herb in traditional medicine due to presence of steroidal saponins and sapogenins (Krishana et al., 2005) and its tuberous root is used in many ayurvedic preparations as growth promoters and immune-

stimulant. Lemongrass essential oil, extracted from fresh lemongrass (*Cymbopogon citratus*) has citral as the key constituent which has been known for its anti-inflammatory, immunomodulatory, fungistatic, antimicrobial, antioxidant and antiseptic properties (Shah et al., 2011). However, there is a limited study on their combinations. Therefore, the following study was designed in order to know the synergistic effect of Licorice, Asparagus root powder and Lemongrass oil on the performance of commercial broiler chickens.

### MATERIALS AND METHODS

To conduct the above study, 300-day-old male broiler chicks (cobb 400) were randomly distributed into six dietary treatment groups each having ten replicates with five chicks each. The chicks were housed in battery brooder cell (2'×2') with an average floor space of 82 square inches per bird. Birds were

immunized against Newcastle Disease (ND) with lasota vaccine on 7<sup>th</sup> (primary) and 28<sup>th</sup> (booster) days of age and infectious bursal disease (intermediate – Georgia strain) vaccine on 14<sup>th</sup> (primary) and 21<sup>st</sup> (booster) days of age. Six experimental diets were formulated: T1 - control i.e., basal diet (BD) without any growth promoter, T2 – BD + 0.05% antibiotic (Bacitracin Methylene

Disalicylate) (AB), T3 – BD + 1% LRP + 2% ARP, T4 - BD + 1% LRP + 250mg LGO, T5 – BD + 2% ARP + 250mg LGO and T6 – BD + 1% LRP + 2% ARP + 250mg LGO. Feed was offered *ad lib* to the birds during pre-starter (0-14 d), starter (15-28 d) and finisher (29-42 d) period (Table 1) to meet the nutrient requirements (BIS, 2007).

Table 1. Ingredient and nutrient composition of basal diet (%) fed to the commercial broilers from 0 to 42 days.

Ingredient	Pre-starter	Starter	Finisher
Maize	51.94	52.86	57.05
Oil	3.70	5.10	6.00
Soyabean meal	40.10	37.80	32.70
Stone grit	1.31	1.31	1.31
Dicalcium phosphate	1.66	1.70	1.78
Salt	0.40	0.40	0.40
DL-Methionine	0.204	0.210	0.230
L-Lysine HCl	0.252	0.190	0.100
Additives*	0.13	0.13	0.13
Nutrient composition (calculated values)			
ME (kcal/kg)	3002	3101.57	3200.70
Crude protein (%)	23.05	22.05	20.07
Lysine (%)	1.30	1.20	1.01
Methionine (%)	0.52	0.51	0.51
Calcium (%)	1.02	1.01	1.01
Available phosphorous (%)	0.45	0.45	0.45

\* Vitamin A 20000 IU, Vitamin B<sub>2</sub> 25 mg, Vitamin D<sub>3</sub> 3000IU, Vitamin K 2mg, Riboflavin 25mg, Vitamin B<sub>1</sub> 1mg, Vitamin B<sub>6</sub> 2mg, Vitamin B<sub>12</sub> 40mg, and Niacin 15mg. Manganese 120mg, Zinc 80mg, Iron 25mg, Copper 10mg, Iodine 1mg.

Body weight of individual birds were recorded at the beginning of the trial and thereafter on weekly basis up to 42 days of age. Feed consumption was recorded at weekly intervals up to 42 days of age. From the recorded data, phase-wise body weight gain and feed conversion ratio of the birds were calculated.

Data obtained were analysed for mean, standard errors and analysis of variance as per method of Snedecor and Cochran (1989). Comparison of means were done using Duncan's test using software of Statistical Package for Social Sciences (SPSS) 20.0 version and significance was considered at P<0.05.

## RESULTS AND DISCUSSION

All dietary combinations containing LRP, ARP and LGO showed significantly (P<0.05) higher bodyweight gain during starter (15-28 d) phase and overall experimental period (0-42 d) when compared to control (Table 2). However, during finisher (29-42 d) phase body weight gain of LRP+ARP and control had significantly (P<0.05) lower bodyweight gain compared to other treatment groups containing LRP + LGO, ARP + LGO, LRP + ARP + LGO and AB. Among different combinations of LRP, ARP and LGO significantly (P<0.05) higher cumulative body weight gain of broilers was observed with supplementation of LRP + LGO.

Table 2. Synergistic effect of licorice root powder, asparagus root powder and lemongrass oil on phase wise body weight gain (g) of broiler chicken

Treatment	Diets	Pre starter (0-14 d)	Starter (15-28 d)	Finisher (29-42 d)	Cumulative BWG (0-42 d)
T1	Control	354.1	837.5 <sup>c</sup>	855.0 <sup>c</sup>	2047.1 <sup>c</sup>
T2	AB	359.5	902.7 <sup>ab</sup>	873.2 <sup>bc</sup>	2135.7 <sup>b</sup>
T3	LRP (1%) + ARP (2%)	343.3	905.9 <sup>ab</sup>	852.4 <sup>c</sup>	2100.7 <sup>b</sup>
T4	LRP (1%) + LGO (250 mg)	357.4	925.1 <sup>a</sup>	940.7 <sup>a</sup>	2222.8 <sup>a</sup>
T5	ARP (2%) + LGO (250 mg)	359.2	903.9 <sup>ab</sup>	878.4 <sup>bc</sup>	2140.6 <sup>b</sup>
T6	LRP (1%) + ARP (2%) + LGO (250 mg)	348.1	888.5 <sup>b</sup>	901.9 <sup>b</sup>	2138.5 <sup>b</sup>
	SEM	2.16	4.611	5.786	8.743
	P- value	0.156	0.001	0.001	0.001

<sup>abc</sup>Means bearing different superscripts within a column are significantly ( $P < 0.05$ ) different. AB- 0.05% Antibiotic; LRP- Licorice root powder; ARP- Asparagus root powder; LGO- Lemongrass oil

These results are in agreement with Kalantar et al. (2014) who supplemented *Thymus vulgaris* L. and *Glycyrrhiza glabra* mixture at 0.5% alone and in combination with enzyme (0.2%) and observed a significant increase in body weight gain of broilers ( $P < 0.05$ ). Similarly, Alagbe and Oluwafemi (2019) reported a significant ( $P < 0.05$ ) increase in body weight gain in broilers fed with inclusion of dried lemon grass and garlic extract in water at 12 ml/lit. Also, supplementation of broilers with Ashwagandha, Shatavari and Kapikachhu at 2% in 50:25:25 ratio reported to have increased body weight gains ( $P < 0.05$ ) (Pandey, 2013). These results were in contrast with Samant et al. (2021), Moradi et al.

(2014) and Kumar et al. (2019) who reported no significant effect on the body weight gain of broilers with the supplementation of licorice, asparagus and lemongrass in the broiler diets.

No significant ( $P > 0.05$ ) difference was observed in feed consumption during pre-starter, starter, finisher and overall experimental period with the supplementation of LRP, ARP and LGO in different combinations in broiler diets when compared to AB and control group (Table 3). Similar results were observed by Samant et al. (2021), Kishor et al. (2020) and Jagdeeswaran et al. (2012) when supplemented with licorice, asparagus and lemongrass in the broiler diets.

Table 3. Synergistic effect of licorice root powder, asparagus root powder and lemongrass oil on phase wise feed intake (g) of broiler chicken

Treatment	Diets	Pre-starter (0-14 d)	Starter (15-28 d)	Finisher (29-42 d)	Cumulative feed intake (0-42 d)
T1	Control	443.3	1359.5	1630.1	3433.0
T2	AB	440.8	1360.3	1613.8	3415.0
T3	LRP (1%) + ARP (2%)	431.8	1340.4	1558.4	3330.8
T4	LRP (1%) + LGO (250 mg)	439.3	1367.9	1613.0	3420.3
T5	ARP (2%) + LGO (250 mg)	441.1	1343.6	1614.4	3399.3
T6	LRP (1%) + ARP (2%) + LGO (250 mg)	435.0	1350.2	1647.8	3433.1
	SEM	2.410	3.551	9.358	11.898
	P- value	0.768	0.181	0.123	0.112

<sup>abc</sup>Means bearing different superscripts within a column are significantly ( $P < 0.05$ ) different. AB- 0.05% Antibiotic; LRP- Licorice root powder; ARP- Asparagus root powder; LGO- Lemongrass oil

Inclusion of different combinations of LRP, ARP and LGO in the diets of broilers showed no significant ( $P > 0.05$ ) effect on the feed conversion ratio during pre-starter (0-14 d) phase of the experiment when compared to AB and control group (Table 4). During starter phase (15-28 d) significantly ( $P < 0.05$ ) better FCR was observed in birds supplemented with LRP+ARP, LRP + LGO, ARP + LGO, LRP + ARP + LGO and AB, and FCR was poor in control group. During finisher phase (29-42 d), birds supplemented with LRP + LGO showed significantly ( $P < 0.05$ ) better FCR followed by LRP + ARP, LRP + ARP + LGO and ARP + LGO, AB group with no significant difference between them respectively. The cumulative FCR was significantly ( $P < 0.05$ ) better in birds supplemented with LRP + LGO and poor FCR was in control group, whereas birds supplemented with LRP+ARP, ARP + LGO, LRP + ARP + LGO and AB showed intermediate effect on the FCR which was significantly ( $P < 0.05$ ) better compared to control.

Similar results were reported by Srivastava et al. (2022) who supplemented Japanese quails with lemongrass and peppermint essential oils (0.05% and 0.1%) in combination and observed significantly ( $P < 0.05$ ) better feed conversion ratio. Pandey (2013) also observed improved feed conversion ratio with the supplementation of a combination of Ashwagandha (*Withania somnifera*), Shatavari (*Asparagus racemosus*), and Kapikachhu (*Mucuna pruriens*) in broiler chicks ( $P < 0.05$ ). Similarly, Kalantar et al. (2014) reported better FCR ( $P < 0.05$ ) in broilers fed with *Glycyrrhiza glabra* (0.5%), *T. vulgaris* and enzyme combination. In contrast, Samant et al. (2021) reported no significant effect on the feed conversion ratio of broilers when fed with lemon grass oil and turmeric rhizome powder in combination. Similarly, Dogan et al. (2018) and Nopparatmaitree et al. (2014) also reported no influence on the FCR of broilers with inclusion of licorice and asparagus in the diets.

Table 4. Effect of licorice root powder, asparagus root powder and lemongrass oil on phase wise feed conversion ratio of broiler chicken

Treatment	Diets	Pre-starter (0-14 d)	Starter (15-28 d)	Finisher (29-42 d)	Cumulative FCR (0-42 d)
T1	Control	1.25	1.62 <sup>b</sup>	1.91 <sup>c</sup>	1.68 <sup>c</sup>
T2	AB	1.23	1.51 <sup>a</sup>	1.85 <sup>bc</sup>	1.60 <sup>b</sup>
T3	LRP (1%) + ARP (2%)	1.26	1.48 <sup>a</sup>	1.83 <sup>b</sup>	1.59 <sup>b</sup>
T4	LRP (1%) + LGO (250 mg)	1.23	1.48 <sup>a</sup>	1.72 <sup>a</sup>	1.54 <sup>a</sup>
T5	ARP (2%) + LGO (250 mg)	1.23	1.49 <sup>a</sup>	1.84 <sup>bc</sup>	1.59 <sup>b</sup>
T6	LRP (1%) + ARP (2%) + LGO (250 mg)	1.25	1.52 <sup>a</sup>	1.83 <sup>b</sup>	1.61 <sup>b</sup>
	SEM	0.008	0.008	0.0119	0.007
	P- value	0.775	0.001	0.001	0.001

<sup>abc</sup>Means bearing different superscripts within a column are significantly ( $P < 0.05$ ) different. AB- 0.05% Antibiotic; LRP- Licorice root powder; ARP- Asparagus root powder; LGO- Lemongrass oil

## CONCLUSION

It can be concluded that supplementation of licorice root powder (1%), asparagus root powder (2%) and lemongrass oil (250mg) in combinations are beneficial in broiler chicken for its remarkable results in terms of growth performance. Also, licorice root powder and lemongrass oil supplementation had economically lowest feed cost per kg weight gain when compared to others. Thus, they can be safely included in broiler diets as a better alternative to antibiotic growth promoter.

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