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EFFECT OF ORAL CONSUMPTION OF GUGGUL (*COMMIPHORA MUKUL*) RESIN FOR POULTRY ON PRODUCTION PARAMETERS

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Abstract

This experiment was conducted to determine the effects of the oral consumption of guggul plant resin (*Commiphora mukul* (MC)) on the production of broiler chicks. The study was conducted on 300 chickens Ross 305 divided into five groups, 60 heads each, kept in 3 cages (20 birds each). The experiment lasted five weeks. From the first day of rearing broilers were fed according to the methodological assumptions. The experimental factor was different part of the resin of *Commiphora mukul* added to the decoction water in an amount of 0% (C- control), 0.5g (group I), 1g (group II), 1.5g (group III) and 2g (group IV). Production results were expressed in body weight, weight gains and feed intake. The European Performance Indicator (EIB), mortality and Feed Conversion Ratio (FCR) were calculated as well. In the broiler chickens receiving resin MC (0.5, 1, 1.5, 2g) in drink water, were an increase in BW and BW gain, FCR, EBI ($P<0.05$). However, the best additive was in (2g/l water) and no significant effect was observed in feed intake in all groups.

Key words : *Commiphora mukul*, Growth performance, broilers.

Introduction

In the recent years, there has been a tendency to use of medicinal plants because of the lower side effects and variety of effective compounds in plants, and especially the recommends by the World Health Organization (WHO) to use of medicinal plants (Kumar S, Rashmi, 2010). Alternative medicine is now on the increase in developing countries in response to world health organization directives culminating in several pre-clinical and clinical studies that have provided the scientific basis for the efficacy of many plants used in folk medicine to treat infections (Dilhudy and Patients, 2003). phytogenic are often used in poultry as feed additives stimulating and to the improved production while keeping a healthy condition. The resin of *Commiphora mukul* belongs to this group. It is characterized by broad dietary and therapeutic properties. The main and active components of these compounds are phenols and terpenes that the mechanism of these compounds action is to damage the glycolipid walls of bacterial cells, which leads to leakage and reduction of cytoplasmic compositions. In the performed researches it is known that medicinal plants and their volatile oil have the charactristic to lower the cholesterol and improve the performance of broilers by increasing the intestinal enzymes (Dorman and Deans, 2000). (Jang *et al.,* 2007) reported that the activities of trypsin and α-amylase in the pancreas and maltaz activity of the proximal part of the small intestine of broiler chickens fed on commercial mixture of medicinal plants ether extract, increased in comparison with the diet containing antibiotics and control diet. They also said that the activity of these enzymes and the growth performance of broilers fed with these compounds in comparison with the control group increased significantly Active pharmaceutical composition of Purple Coneflower are polysaccharides that are able to improve the adjustment of the immune system and hens improve growth performance (Hobbes, 1989). Guggul is as a purifier and an strengthening factor which helps the cells and tissues become rejuvenated (Ruitang, 2007). In accordance with existing experiments and reports, essential oils and extracted chloroform resin extract of guggul and other special compounds extracted from it has antibacterial effects and actively inhibits the growth of Gram (+) and

Gram (-) bacterias (Asif and Sabir, 2004). Noted that guggul methylene chloride extract had a promising therapeutic role against colon cancer induced in rats through its potential anti-inflammatory property, antiproliferative capacity and apoptotic activity. These health-enhancing and therapeutic properties of guggul can probably be used in animal production to achieve a broad spectrum of effects on production performance and the related welfare of animals (Fariba, 2014). Therefore, the aim of the study was to determine the effect of different levels of *Commiphora mukul* resin supplementation in drinking water for broiler chickens on the fundamental production traits.

Material and Methods

Animals and Dietary Treatments

A total of 300 day-old broiler chickens of mixed sex (Ross-308) were weighted and randomly allocated to five treatment groups, each with 3 replicates of 20 chicks. *Commiphora mukul* (CM) resin was grinded to powder and mixed with decoction water 12 hours before (to ensure solubility) and supplemented to the drinking water of chicks during the whole period of the experiment, which lasted 35 days, at levels of 0 g (T_1; Control), 0.5 g CM / l liter water (T_2), 1 g CM / l liter water (T_3), 1.5 g CM / l liter water (T_4), and 2 g CM / l liter water (T_5). *Commiphora mukul* (CM) was added to drinking water from the age of 1 day and until the end of the experiment. The basal diet table 1 was formulated according to nutrient requirements of broilers recommended by National Research Council (NRC, 2014). From day 1 to day 14 the birds were fed a starter diet, and from day 15 to day 35. Chicks were raised on floor pens (120 cm x 120 cm x 80 cm) for 5 weeks and throughout the whole experimental period, there was free access to feed and water. The lighting regime was 23h light followed by 1h of darkness while ambient temperature in experimental house was a constant 32°C for the first week and gradually lowered by 3°C in weeks 2 and 3 before being fixed at 22°C until the end of the experiment.

Performance

For each broiler chicken, the BW of and feed intake were recorded at 1, 10, 21, 35 and 42 days of life. The BW gains (BWG) and feed conversion ratio (FCR) were calculated for each period. The mortality rates were recorded daily, and the weight of dead broiler chickens was used to adjust the average weight gain in the period, feed intake and FCR. The European Performance Indicator (EIB) was calculated as well for the entire feeding period according to the equation (Koreleski *et al.,* 2010):

EBI = [average body weight (kg) × survival rate (%)/ age (days) × feed conversion ratio (kg feed/kg body weight gain)] × 100.

Statistically Analysis

The approach adopted was a completely randomized experimental design with the data statistically analyzed employing the General Linear Models (GLM) procedure of SAS software (SAS., 1996) for analysis of variance (Duncan, 1955). Multiple range test was used to establish the variances among treatment means, which were considered different at $p<0.05$ and $p<0.01$.

Results

Body weight (BW)

Table 2 show that the introduction of *Commiphora mukul* resin (CM) addition to drink water for broilers had no significant effect on body weight in control treatment. The highest value ($P<0.05$) of body weight was founded in treatment (T_5) in the end of experiment, while the other treatments (T_2, T_3, T_4) were gained

Table 1: Composition of basal diet.

Item,%	Starter%	Grower%
	1 to 21 d	22-35 d
Yellow corn, ground	56.0	64.80
Soybean meal (44%CP)	29.0	23.65
Corn gluten meal (60%CP)	8.20	5.80
Vegetable oil	3.40	2.40
Di – calcium phosphate	1.80	1.30
Calcium carbonate	0.90	1.30
Sodium chloride	0.30	0.30
Vit. and Min. premix *	0.30	0.30
DL – Methionine	0.10	0.05
L-Lysine	0.00	0.10
Total	100	100
Calculated analysis (%)**		
CP Crude protein	22.51	19.53
EE Ether extract	2.620	2.840
CF Crude fibre,	2.470	2.420
Ca	0.869	0.906
Available P	0.444	0.346
Methionine	0.515	0.411
Methionine +Cystine	0.944	0.781
Lysine	1.088	1.010
ME, K cal/Kg	3109	3150

Each 3.0 Kg of the Vit. and Min. premix contains : Vit. A, 12000000 IU ; Vit. D3 2500000. IU ; Vit. E, 10 g ; Vit. K, 2.5 g ; Vit. B1, 1.5 g ; Vit. B2, 5 g ; Vit. B6, 1.5 g; Vit. B12,10 mg ; Choline chloride, 1050 g ; Biotin, 50 mg ; Folic acid, 1 g ; Nicotinic acid , 30 g ; Ca pantothenate, 10 g ; Zn, 55 g ; Cu,10 g ; Fe, 35 g ; Co, 250 mg ; Se, 150 mg ; I, 1 g ; Mn, 60 g and anti-oxidant, 10 g. ** According to NRC, 1994.

Table 2: Body weight in broiler chickens in the different rearing stages.

Parameters	Week	Treatments					p-value
		T_1	T_2	T_3	T_4	T_5	
Body weight (g)	1	144.22±0.67	143.54±0.58	145.18± 0.85	144.33± 0.82	146.27± 0.77	N.S
	2	347.36b±1.17	361.09[a]±0.76	363.52a±1.24	363.19a±1.89	366.40a±1.05	*
	3	659.37b±2.16	686.93a±0.85	690.47a±1.40	692.19a±1.57	702.48a±2.03	*
	4	1067.73c±8.33	1121.15b±5.19	1133.52b±7.44	1152.34ab±2.66	1177.25a±8.11	*
	5	1733.15d±11.47	1848.77c±9.62	1869.67bc±5.47	1909.35b±10.36	1962.23a±14.40	*

T_1 served as control while T_2, T_3 , T_4 and T_5 were kept on drinking water containing T_2: 0.5 g (CM) , T_3: 1 g , T_4: 1.5 g, T_5: 2 g./l water. Values (Mean±SD) of each experimental day in each row followed by different letters differ significantly (* p <0.05, NS nonsignificant).

Table 3: Body weight gain (BWG) in broiler chickens in the different rearing stages.

Parameters	Week	Treatments					p-value
		T_1	T_2	T_3	T_4	T_5	
BWG (g)	1	104.22±0.92	103.54±1.02	105.18± 0.55	218.86a±1.00	106.27± 0.44	N.S
	2	203.14b±1.13	217.55a±1.25	218.34a±0.85	329.00a±2.19	220.13a±1.50	*
	3	312.01b±2.36	325.84ab±1.82	326.95a±1.47	329.00a±2.19	336.08a±2.48	*
	4	408.36d±4.77	435.00c±2.69	465.00b±2.11	506.66a±4.09	506.66a±4.12	*
	5	665.42c±3.82	727.62b±2.33	736.15b±3.40	757.01ab±3.77	784.98a±4.50	*
	Total	1693.15d±10.8	1808.77bc±8.13	1829.67b±11.0	1869.35b±11.43	1922.23a±12.27	*

T_1 served as control while T_2, T_3 , T_4 and T_5 were kept on drinking water containing T_2: 0.5 g (CM) , T_3: 1 g , T_4: 1.5 g, T_5: 2 g./l water. Values (Mean±SD) of each experimental day in each row followed by different letters differ significantly (* p <0.05, NS nonsignificant).

significant differences (P <0.05) with control (T_1). However, There were no significant differences between (T_2, T_3) but (T_4) recorded high value with treatments (T_1, T_2) in the five week from broiler's age.

Body Weight Gain (BWG)

Table 3 shows that different levels of CM added to drink water made no significant differences in BWG at 7 days of age. Chicks that received CM showed higher BWG (p<0.05) than control treatments during the period 14 to 21 days of age. As well as T_4 and T_5 had significant effects than other treatments. However, there were significant effects of BWG between T_5 T_3, T_4 at 28d., but the highest value (p<0.05) of BWG was recorded in T_5 (1922.23 g) at the total period (1 to 35)d.

Feed Intake (FI)

Data presented in table 4 shows no significant effects on FI in the period (1, 3, 4 and 5 week) while there are significant effects on FI in the second week from experiment. 14 to 21 days of age. Birds receiving CM in drinking water had higher FI (p<0.05) during the period of 7 to 14 days of age. However, the lowest FI was in control treatment. Whereas, no significant differences in FI among treatments from 21 to 35 days of age.

Feed Conversion ratio (FCR)

Table 5 shows no significant effects on FCR during the 7 days of age in all treatments. Control treatment had lower FCR (p<0.05) during the period 14 to 35 days of age. However, the highest FCR was in birds that received 1.5, 2gMC/l water for the period from 14 to 35 days of age. Whereas, no significant differences in FCR for birds that received 1, 1.5 g MC/l water from 21 to 35 days of age.

Mortality percentage

Cumulative mortality percentage was calculated during the starting and finishing periods and presented in table 6. Obtained results suggest that the percentage of mortality in T_1, T_2 was higher than in treatments T_3, T_4, T_5 and statistically significant (p<0.05).

Economic Efficiency index (EBI)

Table 6 confirmed that EBI value at 35 days of age had a higher value (399.51, 388.48) in birds that received 1.5, 2 g MC/l in drinking water in comparison with control, which had the lowest value (289.13), whereas the other treatment T_2 showed no significant with T_3 and they had significant with control.

Discussion

Effect of *Commiphora mukul* (CM) on broiler performance, *Commiphora mukul* positively affected on body weight, weight gain and E.B.I, especially among broilers that received 2g CM/l in drinking water through the experimental period. These findings may be attributed to the presence of guggulsterone which is a main active substance in gugulipid, an extract of the *C. mukul*, used to treat a variety of disorders in humans, including

Table 4: Feed intake (FI) in broiler chickens in the different rearing stages.

Parameters	Week	Treatments					p-value
		T_1	T_2	T_3	T_4	T_5	
Feed intake (g)	1	96.92±0.39	97.33±0.72	96.77±0.69	97.03±0.51	97.77±0.74	N.S
	2	237.32b±1.02	244.08a±0.74	244.89a±0.46	243.24a±0.35	242.33a±1.11	*
	3	411.29±2.00	401.68±1.30	396.38±1.92	395.32±2.35	396.24±1.48	N.S
	4	660.29±4.33	654.88±3.27	649.26±3.68	658.20±2.86	662.96±4.17	N.S
	5	1244.44±7.56	1260.57±9.11	1245.20±6.82	1240.94±5.55	1253.17±8.63	N.S
	Total	2650.26±11.67	2658.54±13.65	2632.50±8.88	2634.73±12.16	2652.47±9.27	N.S

T_1 served as control while T_2, T_3 , T_4 and T_5 were kept on drinking water containing T_2: 0.5 g (CM) , T_3: 1 g , T_4: 1.5 g, T_5: 2 g./l water. Values (Mean±SD) of each experimental day in each row followed by different letters differ significantly (* p <0.05, NS nonsignificant).

Table 5: Feed conversion ratio in broiler chickens in the different rearing stages.

Parameters	Week	Treatments					p-value
		T_1	T_2	T_3	T_4	T_5	
FCR (g. Feed/g Weight gain)	1	0.93±0.001	0.94±0.002	0.92±0.001	0.94±0.003	0.92±0.002	N.S
	2	1.17b±0.009	1.12ab±0.011	1.12ab±0.010	1.11a±0.008	1.10a±0.012	*
	3	1.32c±0.013	1.23b±0.011	1.21ab±0.014	1.20ab±0.012	1.18a±0.015	*
	4	1.62c±0.014	1.51b±0.011	1.47ab±0.013	1.43a±0.012	1.40a±0.014	*
	5	1.87d±0.015	1.73c±0.016	1.69bc±0.011	1.64ab±0.016	1.60a±0.009	*
	Total	1.57d±0.011	1.47c±0.012	1.44bc±0.011	1.41ab±0.009	1.38a±0.008	*

T_1 served as control while T_2, T_3 , T_4 and T_5 were kept on drinking water containing T_2: 0.5 g (CM) , T_3: 1 g , T_4: 1.5 g, T_5: 2 g./l water. Values (Mean±SD) of each experimental day in each row followed by different letters differ significantly (* p <0.05, NS nonsignificant).

Table 6: Mortility (%) and Production index in broiler chickens in the different treatments.

Parameters	Treatments					p-value
	T_1	T_2	T_3	T_4	T_5	
Mortility (%)	8.33a±1.66	5.00ab±0.00	3.33b±1.66	1.66b±1.66	1.66b±1.66	*
EBI	289.13d±1.42	341.37c±2.02	358.61bc±1.71	380.48ab±2.16	399.51a±1.88	*

T_1 served as control while T_2, T_3 , T_4 and T_5 were kept on drinking water containing T_2: 0.5 g (CM) , T_3: 1 g , T_4: 1.5 g, T_5: 2 g./l water. Values (Mean±SD) of each experimental day in each row followed by different letters differ significantly (* p <0.05, NS nonsignificant).

dyslipidemia, inflammation however, the main and active components of these compounds are phenols and terpenes that the mechanism of these compounds action is to damage the glycolipid walls of bacterial cells, which leads to leakage and reduction of cytoplasmic compositions. In the performed researches it is known that medicinal plants and their volatile oil have the characteristic to lower the cholesterol and improve the performance of broilers by increasing the intestinal enzymes (Dorman and Deans, 2000). Reported by (Jang *et al*., 2007) that the activities of trypsin and α-amylase in the pancreas and maltaz activity of the proximal part of the small intestine of broiler chickens fed on commercial mixture of medicinal plants ether extract, increased in comparison with the diet containing antibiotics and control diet. They also said that the activity of these enzymes and the growth performance of broilers fed with these compounds in comparison with the control group increased significantly.

As seem in table 4, feed intake significantly affected by treatments during starter of the experimental period. Several reports had stated that the aromatic medicinal plant and plants extracts accelerate digestion and shorten the length of the time material passes through the gastrointestinal tract (Alcicek *et al.,* 2003). The main ingredients of the *C. mukul* resin include polysacharids, Terpenoids, Furanosesquiterpenoids, Germacrene and guanine skeleton that causes the resin to be aromatic and fragrant. The probably reason for the increase in feed intake in second week with the applied guggul treatments, maybe from the existence of guanine composition and its fragrancy (Wang *et al.,* 2004; Zhu *et al.,* 2001). There was no further study in the field of communication between *C. mukul* and feed intake. The other possible reason for the increased feed consumption in treatments using *C. mukul* is due to the purgative characteristic of the Guggul (Malhotra *et al.,* 1977) and consequently, reduction in time feed remaining in chicks' gastrointestinal tract. According to earlier studies, it was expected that consumption of *C. mukul* reduces the weight of broiler chickens. (Ruitang 2007) suggested that *C.*

mukul causes weight loss. Also in (Ichikawa 2006) reported that the *C. mukul* resin is useful for the treatment of obesity.

On the other hand, The use of the *Commiphora mukul* resin at the level of 5% in decoction water for broilers caused a negative trend in the feed intake throughout the rearing period, resulting in improved FCR and EEI values ($P<0.05$). The use of phytogenic feed additives and, in particular, therapeutic plants in animal production, improves production efficiency. The introduction of feed materials rich not only in basic nutrients but also in specific bioactive substances enhances the birds' health condition, which determines their high productivity (Hashemi and Davoodi, 2011). This phenomenon can also be observed upon the application of traditional European herbs and spices (Florou-Paneri *et al.,* 2006; Christaki *et al.,* 2012) or even fungi (Giannenas *et al.,* 2010, 2011) as well as phytobiotics (herbs, mushrooms, resins) cultivated and collected outside Europe (Landy *et al.,* 2011; Nadeem, 2012). However, excessive doses of phytobiotics with intense properties such as the *Commiphora Mukul* resin can inhibit animal growth. According to earlier studies, it was expected that consumption of Guggul reduces the weight of broiler chickens. (Ruitang 2007) suggested that Guggul causes weight loss. Also in (Ichikawa, 2006) reported that the Guggul resin is useful for the treatment of obesity. But (Khalili *et al.,* 2007) reported that consumption of guggul in diabetic mice were able to obviously lessen the weight loss of the mice, but in healthy mice it had no significant effect on the mice weight. The weight gain was increased however, it's known as a result of increased feed intake, although the feed intake was not significant during the whole period of experiment.

Conclusion

In conclusion, drinking water supplementation with different levels of *Commiphora mukul* resulted in significant improvement to most of the rearing efficiency, biochemical trails and immune response included within this study. On the other hand, the T_5 (2 g Cm/l water) followed by other treatments with guggul resin appears to be too high to enhancement of general productivity traits and health status. It can be concluded that CM can be regarded as a safe and effective additive in drink water for birds.

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