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Short Communication

Influence of intra-crop gavage of ginger root and rosemary leaves oil extracts on blood biochemical parameters of broiler chicks

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ABSTRACT:

The effect of magnification and herbal crops by using its oil extract directly via intra-crop gavage on live performance and carcass traits of broiler were studied. 192 unsexed one day old broiler chicks (ROSS 308) were distributed into 6 treatments with three replicates per treatment (except 1st and 2nd treat. with 2 replicates) and 12 chicks per replicate, as follows; first one, was the control group without any herbs, the second was a placebo group, the chicks were given normal saline (negative control), the chicks in 3rd and 4th treatments were given rosemary oil extract, finally in the 5th and 6th treatments, chicks were given ginger oil extract. The dosages of herbal oil extract were given via intra-crop gavage twice per week in two interval periods (two days per interval) at the rate of 0.1 mL and 0.2 mL from 1st to 4th week of age and from 5th week till end of experiment at 6th week. Dosage was increased from 0.1 mL to 0.5 mL and from 0.2 to 1 mL per chick with thrice a week (with one day off), in 2nd, 3rd, 4th, 5th and 6th treatments respectively. A medicinal syringe (5 mL capacity) was used and extra 10 cm medicinal plastic pipe were added to the end of medicinal syringe to ensure reach of the oil extract directly to chick's crop.

The results of intra-crop gavage of herbal oil extracts (ginger root and rosemary leaves) revealed that hematological parameters were not affected by these treatments except significant increase in PCV of rosemary oil extract treated groups at 28 and 49 days of broiler age, meanwhile, the data analysis of plasma biochemistry were not affected by intra-crop gavage of herbal oil extracts except total protein concentration at 49 days of broiler age in the treated groups. However, the cholesterol concentration was the only one affected by intra-crop gavage of herbal oil extracts between the other lipid profiles studied in this experiment.

Keywords:

Ginger root, Rosemary, Oil extract, Intra-crop gavage, Blood parameters, Broiler.

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INTRODUCTION

Natural growth enhancers were widely known recently in poultry production instead of using biochemical compounds like antimicrobial drugs due to its side effects and its residues in the animal tissues (Gilani *et al.,* 2018). This recent trend of using natural growth enhancers such as herbal crops was scattered in most of middle East countries as spices and as natural medicinal therapy (Mounia *et al*., 2018; Padihari *et al*., 2014; Salzer, 1995; Torres *et al*., 2015). One of the most famous herbal crops were ginger root (Khan *et al.,* 2012).

Many researchers used ginger root in poultry diets (Elmakki *et al*., 2013; Fakhim *et al*., 2013; Oleforuh-Okoleh *et al*., 2014; Sasidharan and Nirmalamenon, 2010; Sudarshan *et al*., 2010; Tekeli *et al*., 2011) to improve physiological parameter which involved immune and antioxidant status, and that lead to significantly improve live performance of the host (Omar *et al.*, 2016). These advantages of using ginger root were due to the active ingredients which were responsible enhancing live performance through improving internal physiology (blood parameters, immune and antioxidant status, antimicrobial action), both as a powder and as extract of essential oils. Sekiwa *et al.* (2000) found iron, magnesium, calcium and vitamin C in ginger root. These compounds participate in the antimicrobial and anti-inflammatory actions also Ali *et al.* (2008) found that ginger roots modulate or damage generation of free radicals, effect on blood biochemistry and intestinal secretion of active compounds and entire physiology of the host. In addition, Bakkali *et al.* (2008) and Zhao *et al.* (2011) reported some active phenolic compounds in ginger essential oil (gingerdiol, gingerol, gengerdion and shogaols).

Rosemary leaves (*Rosmarinus officinalis*) was another herbal crop well known as a seasoning material for human food. The seasoning compounds of this crops ascribe to aromatic substances which was responsible for the flavor and taste (Mona *et al.*, 2010). It process several important compounds (carnosol, carnosic acid, caffeic acid and rosmarinic acid) as referred by Christaki *et al.* (2012). In addition, rosemary was one of the herbs used widely in broiler production as growth promoter, antimicrobial and antioxidant agent, which had an effect on the later live performance of broiler (Norouzi *et al.*, 2015; Ghazalah and Ali, 2008; Loetscher *et al*., 2013; Rostami *et al*., 2017; Cross *et al*., 2007).

Current experiment tried to investigate the effect of using new approach of giving herbal extract instead of traditional methods (as feed additives and aqueous extract with water). The new method ensure reaching of the herbal extract in small active quantities directly to the beginning of gastrointestinal tract (crop) via intra-crop gavage, to prevent damaging to active herbal components that happens during traditional methods, due to environmental conditions (*e.g.* heat treatments during pelleting or dust in broiler house etc.). So, instead of using entire herbal crops as feed additives, this experiment tried to use only small quantities of active herbal compounds which was in charge of active enhancement in host internal physiology. In brief, this trail was conducted to investigate the effect of intra-crop gavage of oil extract of important widely used herbal crops (ginger root and rosemary leaves) on some hematological and plasma biochemical parameters of broiler.

MATERIALS AND METHODS

This experiment was conducted at Anbar University, College of Agriculture, Department of Animal Production. Herbal crop extracts (rosemary leaves and ginger root) were taken from local herbal market from AL-Anbar province. 192 unsexed one day old broiler chicks (ROSS 308) were distributed into 6 treatments with 3 replicates per treatment (except 1st and 2nd treatment with 2 replicates) and 12 chicks per replicate, as follows;

T_1: Control group (without any treatment)

T_2: The second was a placebo group in which, the chicks were given normal saline (negative control).

T_3 and T_4: The chicks in 3rd and 4th treatments were given rosemary oil extract.

T_5 and T_6: Finally 5th and 6th treatments chicks were given ginger oil extract.

The dosages of herbal oil extract were given *via* intra-crop gavage twice a week in two intervals (two days per interval) at the rate of 0.1 mL and 0.2 mL from 1st week to 4th week and from 5th week till the end of experiment at 6th week. Dosage was increased from 0.1 mL to 0.5 mL and from 0.2 to 1 mL per chick three times in a week (with one day off), in 2nd, 3rd, 4th, 5th and 6th treatments respectively. A medicinal syringe (5 mL capacity) was used and extra 10 cm medicinal plastic pipe was attached to the end of medicinal syringe to ensure reach of oil extract directly to chick's crop.

Broiler chicks were raised at four tiers (120X80X40 cm length, width and height) in 4 batteries, each tier represent the replicate of the treatments (16 tiers). Chicks were exposed to standard environment of broiler rearing according to ROSS 308 manual (ROSS, 2016). Diets were given according to the recommendations of NRC (1994) and the chicks had free access (*ad libitum*) to feed and water. Starter diet was given for first 21 days of chicks life and then for the later period (22-49 days) chicks were given finisher diet. Commercial broiler diets (starter and finisher) were used, and its constituents according to label were as follows; starter diet contains, crude protein (21.5 to 23.5%), metabolizable energy (2800-3000 kcal/kg), methionine (0.46%), methionine + cystine (0.82-0.84%), lysine (1.13-1.04%), available phosphor (0.4%) and Ca (0.87%). finisher diet ingredients were; crud protein (20-21.5%), metabolizable energy (2900-3100 kcal/kg), methionine (0.42%), methionine + cystine (0.7 -0.8%), Lysine (1.2%), available phosphorous (0.4%) and Ca (0.87%). Chemical analysis of starter and finisher diets samples were analyzed using MPA apparatus (Multiple Purpose Analysis), ASTM D92 fully automatic model (TPO-3000), China. The chemical analysis of starter in MPA apparatus showed 21.72% crude protein, 3.68% ether extract, 2.17% crude fiber, 7.77% moisture and 6.86% ash. The chemical analysis of finisher diet according to MPA apparatus showed 19.63% crude protein, 3.46% ether extract, 2.10% crude fiber, 7.30% moisture and 6.48% ash.

Some of the hematological and plasma biochemical parameters were assessed through collecting samples from bronchial vein at 28 and 49 days of broiler age. Firstly, samples were distributed into two tubes, first one for evaluation of the plasma parameters via adding anticoagulant (EDTA) into the sample tubes and the second for hematological parameters evaluation without adding anything to sample tubes.

The hematological parameters involved PCV (Archer, 1965), RBC and WBC counting (Natt and Herick, 1952). After centrifugation of EDTA sample tubes for 10 min at 2000 rpm, the plasma was separated and then kept in freezing condition (-20°C) till the time of measuring plasma biochemical parameters, *viz*: total protein, blood sugar (Astoor and King, 1954; Wotton, 1964), cholesterol, triglycerides (Toro and Ackermann, 1975), HDL, VLDL and LDL (Warnick and Wood, 1995) and the activities of transaminases (AST and ALT). All the plasma parameters were calorimetrically determined using appropriate laboratory kits and following the same steps as described by manufacturers.

All the data were statistically analyzed by one – way analysis to evaluate impact of experimental treatment on hematological and plasma biochemical parameters by applying General Linear Model (GLM) procedure using Statistical software package, SAS version 9.1 (SAS Institute, 2004), at the probability below 0.01 and 0.05 and the data were tabulated as mean/ pooled SEM.

RESULTS AND DISCUSSION

The results of hematological parameters of

Table 1. Influence of herbal oil extracts (ginger root and rosemary leaves) intra-crop gavage on hematological parameters at 28 and 49 days of broiler age

S. No	Hematological parameters	T_1	T_2	T_3	T_4	T_5	T_6	Total mean	Prob.	SEM
1	28 days	-	-	-	-	-	-	-	-	-
2	RBC (10^6×cell/cm^3)	3.43	3.30	3.21	3.26	3.30	3.22	3.29	0.3863	0.0317
3	WBC (10^3×cell/cm^3)	22.73	17.26	25.06	18.40	25.10	16.20	20.81	0.3588	1.47
4	PCV(%)	32.33^{ab}	24.33^{c}	34.00^{a}	33.00^{ab}	28.50^{bc}	30.00^{ab}	30.5	0.0086	1.0246
5	49 days	-	-	-	-	-	-	-	-	-
6	RBC (10^6×cell/cm^3)	3.05	3.05	3.02	3.02	3.05	3.03	3.04	0.9965	0.0212
7	WBC (10^3×cell/cm^3)	18.16	16.93	17.03	16.53	18.25	15.50	17.09	0.8519	0.5955
8	PCV (%)	28.83^{ab}	28.50^{ab}	29.66^{ab}	27.16^{b}	27.00^{b}	31.25^{a}	28.68	0.05	0.4675

T_1 = control without any treatment, T_2 = normal saline (placebo), T_3 and T_4 = intra-crop gavage with oil extract of rosemary leaves, T_5 and T_6 = intra-crop gavage with oil extract of ginger root.

whole blood at 28 and 49 days of broiler age were illustrated in Table 1. Packed Cell Volume (PCV) were significantly increased in ginger root treated group at 28 day and in rosemary leaves at 49 days of broiler age, whereas, the rest of hematological parameters had non-significant differences between treatments. These findings were in accordance with previous work dealing with adding rosemary leaves and ginger root as an feed additives. Saleh *et al.* (2014) reported a significant increase in PCV and WBC of ginger oil treatment, without any significant effect on RBC. Also, Ghasemi and Taherpour (2015) noticed a non-significant effect of adding ginger to broiler diets on RBC and WBC, meanwhile, the results of rosemary oil intra-crop gavage were in line with Abd El-latif *et al.* (2013) when they noticed the significant effect of rosemary essential oil only in PCV and WBC without any significant effect on RBC.

Effect of intra-crop gavage of the 0.1 extracts on plasma biochemical parameters at 28 and 49 days of broiler age were tabulated in Table 2. From a probability column a non-significant effect of treatments on these parameters were noticed. Habibi *et al.* (2014) did not notice any significant effect of adding ginger root or its essential oil on total protein, glucose and albumin between treatments. In contrast to these results, Barazesh *et al.* (2013) found a significant effect of adding ginger

Table 2. influence of herbal oil extracts (ginger root and rosemary leaves) intra-gavage on plasma biochemical parameters at 28 and 49 days of broiler age

S. No	Plasma biochemical parameters	T_1	T_2	T_3	T_4	T_5	T_6	Total mean	Prob.	SEM
1	28 days	-	-	-	-	-	-	-	-	-
2	Total protein (g/dl)	4.76	4.53	4.70	5.33	4.90	4.60	4.81	0.3956	0.1168
3	Glucose (mg/dl)	136.67	138.33	132.67	147.00	126.50	150.00	138.56	0.4971	3.3923
4	ALT (IU/L)	16.63	14.30	14.93	14.80	17.00	15.95	15.49	0.3592	0.4107
5	AST (IU/L)	14.76	14.23	14.70	15.36	15.35	13.35	14.66	0.6046	0.3143
6	49 days	-	-	-	-	-	-	-	-	-
7	Total protein (g/dl)	4.83^{a}	4.95^{a}	4.91^{a}	4.20^{ab}	3.57^{b}	4.70^{a}	4.57	0.0929	0.1540
8	Glucose (mg/dl)	160.00	154.83	153.00	156.33	146.00	161.25	155.43	0.8454	3.0552
9	ALT (IU/L)	4.23	4.63	4.23	3.56	3.77	4.10	4.10	0.9150	0.2785
10	AST (IU/L)	12.36	11.86	12.75	12.48	12.77	12.22	12.4	0.9952	0.4683

T_1 = control without any treatment, T_2 = normal saline (placebo), T_3 and T_4 = intra-crop gavage with oil extract of rosemary leaves, T_5 and T_6 = intra-crop gavage with oil extract of ginger root.

Table 3. influence of herbal oil extracts (ginger root and rosemary leaves) intra-gavage on plasma lipid profile at 28 and 49 days of broiler age

S. No	Lipid profile	T_1	T_2	T_3	T_4	T_5	T_6	Total mean	Prob.	SEM
1	28 days	-	-	-	-	-	-	-	-	-
2	Cholesterol (mg/dl)	204.33	194.33	187.33	180.33	214.00	189.50	194.12	0.6316	5.4397
3	Triglyceride (mg/dl)	35.67	34.00	46.00	52.00	24.80	27.00	37.91	0.5515	4.4980
4	VLDL (mg/dl)	7.13	6.80	9.20	10.40	4.95	5.10	7.54	0.5166	0.8991
5	HDL (mg/dl)	65.67	73.62	47.79	57.60	63.99	60.48	61.43	0.3536	3.4726
6	LDL (mg/dl)	127.93	114.37	130.03	112.17	144.70	123.70	124.39	0.8171	6.3353
7	49 days	-	-	-	-	-	-	-	-	-
8	Cholesterol (mg/dl)	103.67^{ab}	91.00^{b}	110.50^{ab}	104.00^{ab}	93.75^{b}	118.25^{a}	103.21	0.05	3.1733
9	Triglyceride (mg/dl)	39.77	65.33	54.00	56.33	48.38	37.38	51.11	0.4757	4.4461
10	VLDL (mg/dl)	9.13	11.16	11.80	11.20	7.15	7.45	9.90	0.4754	0.8158
11	HDL (mg/dl)	73.37	67.91	64.65	66.33	60.08	73.71	67.77	0.7803	2.7297
12	LDL (mg/dl)	28.80	21.63	26.28	34.56	26.15	34.90	28.49	0.4894	2.2063

T_1 = control without any treatment, T_2 = normal saline (placebo), T_3 and T_4 = intra-crop gavage with oil extract of rosemary leaves, T_5 and T_6 = intra-crop gavage with oil extract of ginger root.

root at the rate of 0.5% to broiler diets on glucose. Qorbanpour *et al.* (2018) confirmed a non-significant effect of adding ginger root on plasma biochemical parameters (total protein, glucose and albumin). The results of intra-crop gavage of rosemary oil extract was in line with the findings of Abd El-latif *et al.* (2013) who noticed a non-significant effect of adding rosemary leaves to broiler diets on total protein, albumin and glucose, the activity of ALT and AST enzyme, in spite of non-significant effect of adding rosemary to broiler diets in previous work, by Yildirim *et al.* (2018) who reported a significant increase in serum total protein, glucose, the activity of ALT and AST enzyme in the rosemary essential oil treated groups.

Results of lipid profile affected by oil extract intra-crop gavage were illustrated in Table 3. Plasma cholesterol was affected by rosemary treatment at 49 days of broiler age without any significant difference between other treatments. Abd El-latif *et al.* (2013) obtained the same significant effect of adding rosemary essential oils in broiler diets when they reported a significant increase in total cholesterol of rosemary essential oils treated group in comparison with the rest of the treatments. Recently, Alimohammedi-Saraei *et al.* (2018) confirmed a significant effect on the lipid profile (HDL) of the rosemary treated group. In contrast, the effect of oil extract of ginger root significantly decreased cholesterol in the plasma in comparison to the rest of the treatments. Babu and Srinivasan (1997) stated that significant decrease in cholesterol in ginger root and other spicy crop may be due to enhancing activity of some liver enzyme (microsomal aryl hydrolase and cholesterol 7-alpha -hydroxylase) which is responsible for cholesterol hydrolysis, and that leads to the decreased cholesterol concentration in plasma of ginger treated group. These results were in line with the results of Rafiee *et al.* (2013) who found that adding ginger cause a significant decrease in triglyceride and cholesterol level, whereas, Habibi *et al.* (2014) did not find any significant differences due to adding ginger root or its essential oils on lipid profile (total cholesterol, triglyceride, HDL, LDL and VLDL). In contrast to these results, Barazesh *et al.* (2013) found a significant effect of adding ginger root on HDL and LDL, without any significant effects on triglycerides and cholesterol.

The discrepancy of the current results with the

previous work on the same field reflect some points that most researchers did not consider it firstly, Khan *et al*. (2012) reviewed several researchers dealing with adding ginger root to broiler diets and they stated that their results had a ambivalent results due to different doses of ginger root used in these experiments. So, the doses of oil extract was not clear enough to the level of promoting active effects in the host. In addition, the intra-crop gavage approach was used in most of the pathogenic studies to reach pathogenic microorganisms directly to birds. So, the doses were well known in contrast to the case in current experiment, the intra-crop dose were not known. Secondly, the current results contradicted to the reported results of previous work of many experiments conducted in this field which have a significant action of oil extracts of several herbal crops on serum or plasma biochemistry, and that could be attributed to the form of herbal extract used in these experiments, (powder, aqueous extract, essential oil extracts etc.). This situation imposed a lot of damage to many herbal ingredients, in case of ginger, some damages happened to active ingredients when transformed from powder to oil extract (form ketone derivatives, gingerol, shogaols, gingerdiol and gingerdione). Finally, seasoning herbal like ginger root and rosemary leaves, increase feed intake by improving palatability of feed. This condition does not happen in the current experiment because these herbal extract was not added via feed, but the entrance to host bodies via intra-crop gavage, and that may be the reason for non-significant effects of these herbs on the blood parameters, because they did not induce feed intake and promote a post active effect on the host.

CONCLUSION

It could be concluded from this trial that intra-crop gavage of herbal oil extract does not significantly affect the hematological and plasma biochemistry of broiler at 28 and 49 days of age.

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