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EFFECT OF CINNAMON AND GINGER COMPARED TO DOXYSTIN (ANTIMICROBIAL DRUG) ON SERUM LIPID PROFILE IN BROILER CHICKS

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ABSTRACT: *The aim of this study was to assess the effect of the medicinal plants cinnamon (Cinnamomum verum) and ginger (Zingiber officinale), as natural feed additives in comparison to (Doxystin) ("Doxycycline HCl 50 mg and Colistin sulfate" , known antimicrobial growth promoter) on the serum lipid profile of broiler chicks. One hundred and sixty (one day-old) broiler chicks were assigned to four groups of the same mean weight, each with four replicates of ten chicks. The first group was used as control group and fed broilers basal diet, the second group fed the basal diet supplemented with the (Doxystin) as 0.5%, the third and fourth groups fed basal diet mixed with C. verum, and Z. officinale as 2% of the diet respectively. The experimental diets affected all parameters measured follows, total cholesterol and serum (low density lipoprotein) LDL-C concentration was significantly (P<0.05) decreased in groups received spices diet compared to Doxystin and control groups. Whereas, the (high density lipoprotein) HDL-C concentration showed significantly (P<0.05) lower levels in the two spice treated groups compared to the control group only, and the antibiotic treated animals showed similar level to that observed in spice treated groups. Triacylglycerols and the VLDL-C fraction showed clearly reduced values in all treated groups compared to the control group, though the difference was not significant but it was more pronounced in the spice treated groups, as they reported half the level of the control group. It can be concluded that inclusion of C. verum and Z. officinale as feed additives acted as natural hypocholesterolemic agents in broiler chicks in particular and reduced blood lipids in general.*

ORIGINAL ARTICLE

Key words: *Lipid, Cholesterol, Cinnamon, Ginger, Broiler, Chicks*

INTRODUCTION

The spread of drug resistant pathogens is one of the most serious threats to successful treatment of microbial diseases. Down the ages essential oils and other extracts of plants have evoked interest as sources of natural products. They have been screened for their potential uses as alternative remedies for the treatment of many infectious diseases (Tepe et al., 2004). Essential oils have been shown to possess antibacterial, antifungal, antiviral, insecticidal and antioxidant properties (Burt, 2004). Alam khan et al. (2003) found that *C.verum* bark powder at different doses 1, 3 and 6 g/day prevents hypercholesterolaemia and hypertriglyceridaemia and lowers the levels of free fatty acids and triglycerides in plasma of type 2 diabetic subjects by its strong lipolytic activity. Cinnamate, a phenolic compound found in *C.verum* bark and other plant materials, lowers cholesterol levels in high fat-fed rats by inhibiting hepatic 5-hydroxy-3-methylglutaryl-coenzyme A (HMG-CoA) reductase activity (Lee et al., 2003).

Z.officinale is used for a large variety of illnesses, including sickness, respiratory and gastrointestinal disorders. Anti– ulcer activity is attributed to the volatile oil, especially the 6-gingesulfic acid content (Heinric, 2004). Kamal et al. (2009) cited that, the Z.*officinale* is documented as good hypolipidaemic as well as antioxidant natural agents. Z.*officinale* was found to be significant in lowering the level of serum total cholesterol, serum triglycerides, serum LDL-cholesterol, serum VLDL-cholesterol and in increasing the level of serum HDL-cholesterol in patients of primary hyperlipidaemia. The objective of this study was to evaluate the effect of *C.verum and Z.officinale* as natural plants compared to antibiotic on serum lipid profile of broiler chicks.

MATERIAL AND METHODS

The present study was carried out at the Animal House of the poultry Production Department, Faculty of Animal production, University of Khartoum. It included 160 unsexed white broilers (Cobb – strain). The birds were

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kept in an open sided poultry house for six weeks. The bird fed starter diet from day 1-21days and finisher diet form 21-42 day of age (Table 1).

Table 1 - Composition and calculated analysis of the basal diet fed to the experimental birds

Ingredients As percentage	% (1-3wks) Starter Control	% (4-6wks) Finisher Control	% (1-3wks) Starter Spices	% (4-6wks) Finisher Spices
Sorghum	65.1	66.5	63.1	64.5
Groundnut meal	18.7	13.5	18.7	13.5
Sesame meal	10	12.7	10	12
Super concentrate*	5	5	5	5
Lime stone	0.9	0.9	0.9	0.9
Salt	0.25	0.25	0.25	0.25
Lys	0.04	0.06	0.04	0.06
Meth	0.01	0.01	0.01	0.01
Vegetable oil	0	1.08	0	1.8
Spices	0	0	2	2
Total (100%)	100	100	100	100

*Broiler Super concentrate contains (%): CP 40, CF 1.5, ME 2122Kal/kg, fat 3,Lysine13.5, Methionine 5.9, Methionine+cystine6.25,P 4.6, Ca 6.8, Na 1.5. Vitamins supplied per Kg of diet: Vit. A, 250 000 IU; Vit. D3, 60 000 IU; Vit. E, 800 mg; Vit. K3,60 mg; Vit. B1, 30mg; Vit. B2, 100 mg; Vit. B6, 50 mg; Vit. B12, 300 mg; Vit. C, 4000 mg; Niacin, 800mg; Folic acid,30mg; Biotin, 30mg;Choline chioride,3000mg; Copper, 30 mg; Iron, 100mg; Manganese, 160mg; Zinc,100mg; Iodine,1.3mg; Selenium, 5mg; Cobalt, 1.2mg; Fytase enzyme, 15000; Antioxidant.

The spices were brought from Khartoum local market then cleaned, dried and powdered. The antibiotic which has been used in this treatment was the Doxystin. Each gram of the Doxystin contains: (Doxycycline HCl 50 mg) and (Colistin sulfate 400 000 IU).

The experimental diet was formulated from local ingredients and formed as follow: Group (A) fed basal diets only and kept as control. Group (B) fed basal diet plus the antibiotic (Doxystin) as 0.5%. Group (C) fed diets plus *C.verum* powder as 2%. Group (D) fed diets plus *Z.officinale* powder as 2%. Water and diet were freely accessed.

At 42 days the blood samples were collected from the birds at slaughter in to clean tubes and allowed to clot. Then the samples were centrifuged at 3000 r.p.m for 5 minutes and sera were separated, then they were collected into plain containers and used in the evaluating blood parameters. The lipid profile parameter evaluated were total cholesterol, HDL, LDL and Triglyceride.

High density lipoprotein-cholesterol (HDL-c) in the sample was determined according to the precipitation method described by Friedwald et al. (1972).

The cholesterol concentration was estimated by an enzymatic method which measures the total cholesterol concentration in the serum as described by Richmond, (1973).

Low density lipoprotein- cholesterol (LDL-c) was estimated in (mg/L) the following formula is used:

LDL cholesterol = Total cholesterol –Triglycerides/5 - HDL cholesterol

Triglycerides (TG) in the sample were determined according to the enzymatic colorimetric method described by Bucolo and David (1973).

The data were analyzed by one way ANOVA procedure according to SPSS computing software program. Each test was conducted at 5% level of significant.

RESULTS

The effect of inclusion of 2% dietary powdered spices and 0.5% doxystin on broiler chicks serum total cholesterol concentration is presented in Table 2. There was significant ($P<0.05$) decrease in the mean values of serum total cholesterol concentration in *C.verum* and Z.*officinale groups* compared to doxystin and control groups. The results also showed no significant difference within the spices groups for the serum total cholesterol concentration, but there was a numerical decrease in the total cholesterol concentration of *C.verum* group compared to Z.*officinale* group.

Also there was a significant ($P<0.05$) decrease observed in LDL concentration in all spices treated groups compared to the doxystin treated group.

The results showed significant ($P<0.05$) decrease in the level of HDL concentration in the experimental groups compared to the control with no significant difference within the experimental groups when compared together.

There was no significant change reported between the experimental groups and control on broiler chicks' serum triglycerides (TG) and Very low density lipoprotein cholesterol (VLDL) concentrations. But there was a numerical decrease observed in the mean values of TG and VLDL concentrations in all treated groups compared to the control group.

This effect was clear in the groups treated with Z. *officinale* and *C. verum,* respectively where the level of the TG and VLDL were just half the level in the control group.

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Table 2 - Effect of inclusion dietary powdered spices and doxystin on broiler chicks serum lipid profile

Parameters \ Groups	Control	Doxystin	*C.verum*	Z.*officinale*
Cholesterol (mg /dl)	314.72^{a}±19.42	287.23^{a}±54.56	128.14^{b}±10.73	159.96^{b}±15.25
HDL (mg/dl)	179.69^{a} ±8.02	69.26^{b}±11.27	103.03^{b}±25.05	111.44^{b}±5.57
LDL (mg/dl)	128.51^{a}±18.61	160.76 ^{a}±40.06	42.59^{b}±8.91	54.06^{b}±11.61
TG (mg/dl)	53.59±15.57	42.45±8.55	29.62±10.06	27.55±7.04
VLDL (mg/dl)	10.72±2.7	8.49±1.48	5.92±1.77	5.51±1.22

^{a,b,c} : Row means with no common superscript differ significantly at (P<0.05).

DISCUSSION

The results showed significant (P<0.05) decrease in the mean values of serum total cholesterol concentration in spices treated groups compared to doxystin treated and the control groups. *C.verum* treated group showed the lower numerical value compared to the Z. *officinale* group this result is in agreement with results obtained by AL-Kassie (2009) who reported that, the supplementation of 200 ppm oil extract derived from *C.verum* in broiler diets for period of 6 weeks, significantly (P<0.05) decreased serum cholesterol level. This considered to be related to the cinnamic acid significantly inhibit activity of hepatic HMG-CoA reductase, a key enzyme involved in regulating cholesterol metabolism and decrease serum total cholesterol level (Lee et al., 2007).

Agoreyo et al. (2008) studied the effect of aqueous extract of *Z.officinale* on plasma cholesterol concentration in cholesterol-induced albino rats. They found that, *Z.officinale* revealed a statistically significant (P<0.05) decrease in plasma cholesterol in comparison with the control group. There are several mechanisms by which plant products may lower cholesterol and triglyceride levels, either by increase removal of VLDL by peripheral tissues (Harris et al., 1984) or increased excretion of bile in the feces (Balasubramaniam et al., 1985). Kamal et al. (2009) interpreted that the *Z.officinale* (Zanjabeel) is documented as good hypolipidaemic natural agent. The level of serum LDL-c decreased significantly (P<0.05) in broiler chicks after feeding 2% powdered *C.verum*, and Z.*officinale* compared to the control group. There was also significant (P<0.05) decrease in the level of serum LDL-c concentration in spices treated groups compared to doxystin treated group.

The effect found in the *C.verum* treated group in the present work agrees with Raza et al. (2005) who found that, the level of plasma LDL-c of the hypercholesterolemic was decreased significantly after administration of 1.5 gms *C.verum* for 40 days, compared to the control. Z.*officinale* treated group results also agrees with Kamal et al. (2009) who cited that, the Z.*officinale* (Zanjabeel) is documented as good hypolipidaemic natural agents. Z.*officinale* (Zanjabeel) was found to be significant in lowering the level of serum LDL-c in patients of primary hyperlipidaemia. There was a significant (P<0.05) decrease in the level of HDL concentration in the experimental groups compared to the control but with no significant difference within the experimental groups. Similar effect was observed in the previous studies treated by the same types of spices. Ali, (2009) found that, oral administration of *C.verum* decreased significantly the concentration of plasma HDL-c. But disagrees with Raza et al. (2005) who found that, the level of plasma HDL-C of the hypercholesterolemic patients was increased significantly after administration of 1.5 gms *C.verum* for 40 days, compared to the control.

In study carried by Bhandari et al. (2005) the serum HDL-cholesterol concentration was not altered either by the high-fat diet or by *Z. officinale* treatment. The reason for this variability was suggested to be due to the differences in the kind of experimental disease models used.

The effect of inclusion of 2% dietary powdered spices and 0.5% doxystin on broiler chicks, showed no significant change between the experimental groups and control group serum triglycerides (TG) and Very low density lipoprotein cholesterol (VLDL) concentrations. But there was a numerical decrease observed in the mean values of TG and VLDL concentrations in the experimental groups compared to the control group. These finding agrees with previous studies. Ali, (2009) reported that, oral administration of *C.verum* decreased insignificantly the concentration of plasma TG and VLDL-C when compared to untreated control .

Kamal et al. (2009) interpreted that the Z.*officinale* (Zanjabeel) is documented as good hypolipidaemic as well as antioxidant natural agents. Z.*officinale* (Zanjabeel) was found to be significant in lowering the level of serum TG and serum VLDL-cholesterol in patients of primary hyperlipidaemia.

The antimicrobial drug the Doxystin does not lowered the LDL-C (the bad cholesterol) in the experimental animals but reduced the HDL-C (the good cholesterol) significantly and reached a very low level compared to the control group. This observation is in favor for the use of spices as food additives as it will lower blood bad cholesterol without lowering the good one.

CONCLUSIONS

Findings in the present work showed clear cut information that Z.officinale and *C.verum* reduced serum total cholesterol and its fractions LDL_C and the HDL_C in broiler chicks. The VLDL_C fraction and the triacylglycerols were not significantly reduced. The antimicrobial drug the Doxystin does not lowered the LDL-C but reduced the HDL-C significantly in the experimental animals.

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