

Effect of garlic and cinnamon in comparison to virginiamycin on performance and some haematological parameters in broiler chicks

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Abstract

This study was conducted to evaluate the comparative effect of garlic cinnamon with virginiamycin on performance of broiler chicks. A total 320 one day broiler chicks with an average weight of 39 ± 30 g were randomly divided into 4 treatments. Each treatment was further divided into 4 replicates. Chicks were fed a basal diet as control group, basal diet + 0.02% garlic powder (T₁), basal diet + 0.02% cinnamon powder (T₂) and basal diet + 0.02% virginiamycin powder (T₃). At the end of trial (42 days), two birds from each treatment were weighed and slaughtered. Data showed that FI decreased significantly in T₁, T₂ and T₃ in comparison to control ($P < 0.05$). Body weight gain and total body weight were also significantly higher in treated groups. Triglyceride and cholesterol level decreased significantly in T₁, T₂ and T₃ group. LDL level decreased significantly and HDL levels increased in all of the treated groups. Antibody titre increased significantly in treated diet compared to the control group. We concluded that the use of garlic and cinnamon at the present level enhanced body performance, cholesterol profile and antibody titre on broiler chicks almost equally to the use of antibiotics.

Keywords: Garlic; cinnamon; virginiamycin; performance; broilers

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Introduction

Feed additives are generally used to improve feed intake and to increase the growth rate in broilers (Scott et al., 1982). Garlic (*Allium sativum*) is known as herbal medicine for the prevention and treatment of a variety of diseases ranging from infections to heart diseases (Ologhobo et al., 2008). Garlic is considered as a plant with antibiotic, anticancer, antioxidant, immunomodulatory, anti-inflammatory, hypoglycemic and cardiovascular-protecting effects (Mansoub, 2011). Some researchers reported that garlic can improve productive performance of broiler chicks (Elagib et al., 2013). Cinnamon is a spice obtained from several trees from the genus (*Cinnamomum*) that is used in both sweet and savoury foods. It is a disinfectant, antifungal and

antimicrobial compound. The main constituents of the cinnamon oil include cinnamaldehyde, 2-hydroxy-cinnamaldehyde, cinamyl acetate, coumarin, eugenol and caryophyllin. The cinnamon oil also contains 4-10 phenolic compounds (mainly eugenol), hydrocarbons (alphapinene and caryophyllin) and small amounts of ketones, alcohols and esters (Choct, 2001). Al-Kassie (2009) reported that the broilers fed with cinnamon oil showed lower blood cholesterol level and a lower heterophil to lymphocyte ratio.

Virginiamycin is a streptogramin antibiotic similar to pristnamycin and quinupristin/dalfopristin. It is a combination of virginiamycin M1 and virginiamycin S1. It was used in the fuel ethanol industry to prevent microbial contamination. It was also used in agriculture, specifically in livestock, to accelerate the growth of the animals and to prevent and treat

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infections (Teymourizadeh et al., 2009). Ghaedi et al. (2014) showed that use of virginiamycin in broiler chicks decreased intestinal *E. coli* population and increased *Lactobacillus* population.

The purpose of this study was to evaluate the effect of garlic and cinnamon powder as growth promoters in comparison to virginiamycin antibiotic on broiler performance and some haematological traits.

Materials and Methods

The experiment was carried out at the poultry farm of Veterinary College, Islamic Azad University, Shahrekord branch, Iran. A total of 320 days old broiler (Ross 308 strain) chicks with an average weight of 39 ± 30 g were divided into four treatment groups and were further subdivided into four replicates. The garlic and cinnamon was purchased from local market and dried with sun light. Then they were grounded separately to a fine powder and mixed with the basal diet. The treatments were divided as basal diet with no herbal plants kept as control, basal diet+0.02% of garlic powder (T₁), basal diet+0.02% of cinnamon powder (T₂), basal diet+0.02 of virginiamycin powders (T₃). The chemical composition of the experimental basal diets is shown in Table 1. Feed and fresh water were provided *ad libitum* during this experiment. The live body weight gains of birds were measured individually and feed consumption and feed conversion efficiency were calculated weekly. At the end of experimental period, (two birds from each replicates) were slaughtered by cervical dislocation.

Evaluation of blood parameters

Blood samples were taken from the brachial vein from two birds per replicate and stored at refrigerator at +4°C. Blood samples were subjected to biochemical analysis for cholesterol and triglycerides. Serum samples were isolated by centrifugation at 2000 g for 10 min. Individual serum samples were analyzed for total cholesterol, high density lipoprotein (HDL) and low density lipoprotein (LDL) cholesterol and triglyceride, by an automatic biochemical analyzer following the instructions of the corresponding reagent kit (Pars Azmoon Co., Teheran, Iran). In addition, the systemic antibody response to Newcastle vaccine was assessed on 35 and 42 day of the experiment. Blood samples were centrifuged at 2000 g for 10 min to obtain serum (SIGMA 4-15 Lab Centrifuge, Germany). Serum was isolated and stored at -80°C. Antibody titres against Newcastle and influenza viruses were measured using Haemagglutination Inhibition Test.

Data analysis

Data were collected and analyzed using the General linear model procedure of SAS (2001).

Differences between means were analyzed by Duncan's multiple ranges test and P value less than 0.05 was considered as significant.

Results

Data showed that FI and TFI decreased significantly ($P < 0.05$) in T₁ and BW and TBW increased significantly in T₃ ($P < 0.05$) as shown in Table 2. The serum cholesterol profile is given in Table 3. The results indicated that triglyceride, cholesterol and LDL decreased significantly in treated groups compared to the control while HDL increased in treated groups. The antibody titre is given in Table 4. Antibody titre significantly improved when broilers were fed the ration T₁, T₂ and T₃ ($P < 0.05$). The best response was observed in T₃.

Discussion

In the present study, treatments improved the growth performance in broiler chickens. In the available literature, mixed results are available on the effects of garlic and cinnamon in broiler ration. Al-Kassie (2009) showed that the chickens fed with cinnamon had higher FI compared with the control treatment which is in contrast to our results. Fadlalla et al. (2010) found that there is no difference between control group and broilers fed with garlic in both body weight gain and feed intake. Najafi and Taherpour (2014) reported the lowest FCR in the birds fed diets supplemented with 0.4% cinnamon. Galib et al. (2010) stated that the improvement in BWG and FCR of broilers fed with a mixture of herbs may be due to the active ingredients such as anethole in anise, menthol in peppermint and cinnamaldehyde in cinnamon.

In the current study, the cholesterol profile improved in the treated groups. Najafi and Taherpour (2014) showed the lowest serum cholesterol level ($P < 0.05$) in broilers fed with 0.8% cinnamon and the highest ($P < 0.05$) concentration was noted in control and antibiotic groups. Mansoub and Nezhady (2011) showed that the serum total cholesterol and triglycerides concentration reduced significantly by dietary garlic compared to the control group. Ologhobo et al. (2008) reported that garlic has reducing effect on triglyceride level and the best result was obtained in 2% of garlic in the basal diet. Ciftci et al. (2010) found lower serum cholesterol levels in broilers fed 100 ppm or 200 ppm of cinnamon compared with the control group. Ghaedi et al. (2014) found that virginiamycin decreased cholesterol, triglycerides and LDL in broiler chicks. According to some studies, active ingredients of medicinal herbs inhibit activity of hydroxymethyl glutaryl coenzyme A reductase (HMG-CoA) in the liver. This enzyme is a key regulatory

Table 1: Composition of the experimental diets for broiler chicks

Ingredients %	0-14 (days old)	15-29 (days old)	29-42 (days old)
Maize	51.64	56.61	60.37
Soybean meal	37.74	32.30	27.81
Wheat	5	5	5
Soybean oil	1.40	2.03	2.84
Dicalcium phosphate	1.56	1.47	1.39
Calcium Carbonate	1.17	1.13	1.08
D-L Methionine	0.30	0.29	0.27
L-Lysine	0.13	0.13	0.30
Nacl	0.26	0.24	0.14
Vitamin Premix*	0.3	0.3	0.3
Mineral Premix*	0.3	0.3	0.3
Garlic/Cinnamon/Virginiamycin	0.2	0.2	0.2
Calculated nutrient content			
ME(Kcal/Kgr)	2.850	2.950	3.050
CP (%)	22	20	18.5
Ca (%)	0.90	0.85	0.80
Available Phosphorus (%)	0.45	0.42	0.40
Lysine (%)	1.35	1.20	1.16
Na (%)	0.16	0.15	0.15
Methionine+Cystine (%)	0.97	0.87	0.85
Supplied Per Kilogram Of Feed: 7.500 IU of vitamin A, 2000 IU vitamin D3, 30 mg vitamin E, 1.5 µg vitamin B12, 2 mg B6, 5 mg Vitamin K, 5 mg vitamin B2, 1 mg vitamin B1, 40 mg nicotinic acid, 160µg vitamin Biotin, 12 mg Calcium pantothenate, 1 mg Folic acid, 20 mg Fe, 71 mg Mn, 100µg Se, 37 mg Zn, 6 mg Cu, 1.14 mg I, 400 µg Cu.			

Table 2: The effect of added experimental diets on broilers performance

Treatments	FI (g/d)	BW (g/d)	FCR	TFI (g)	TBW (g)
Control	89.34 ^a	39.44 ^d	2.26 ^a	3753 ^a	1655 ^c
T ₁	86.41 ^c	41.06 ^c	2.10 ^b	3629 ^c	1725 ^b
T ₂	85.91 ^d	42.12 ^b	2.02 ^c	3608 ^c	1770 ^b
T ₃	87.64 ^b	43.27 ^a	2.01 ^c	3680 ^b	1817 ^a
MSE	0.34	0.26	0.09	0.23	0.87

Means within column with no common letter are significantly different (P<0.05). Control: Basal diet; T1: basal diet with 0.02% garlic, T2: basal diet with 0.02% cinnamon, T3: basal diet with 0.02% virginiamycin. FI: feed intake, BWG: body weight gain; FCR: Feed conversion ratio, TFI: total feed intake; TBW: Total body weight

Table 3: The effect of added experimental diets on some blood parameters

Treatments	Triglyceride (mg/dl)	Cholesterol (mg/dl)	HDL (mg/dl)	LDL (mg/dl)
Control	84.41 ^a	137.52 ^a	58.46 ^c	78.23 ^a
T ₁	82.36 ^c	131.18 ^c	62.34 ^a	70.19 ^c
T ₂	82.08 ^c	132.28 ^b	61.55 ^b	68.42 ^d
T ₃	81.44 ^b	130.21 ^d	61.75 ^b	76.60 ^b
MSE	0.10	0.13	0.21	0.65

Means within a column with no common letter are significantly different (P<0.05). Control: Basal diet; T1: basal diet with 0.02% garlic, T2: basal diet with 0.02% cinnamon, T3: basal diet with 0.02% virginiamycin

Table 4: The effect of experimental diets on antibody titers against New castle vaccine

Treatments	HI _(35 days)	HI _(42 days)
Control	3.45 ^d	4.17 ^d
T ₁	3.62 ^c	4.78 ^b
T ₂	3.80 ^b	4.51 ^c
T ₃	4.15 ^a	5.08 ^a
MSE	0.31	0.36

Means within column with no common letter are significantly different (P<0.05). Control: Basal diet; T1: basal diet with 0.02% garlic, T2: basal diet with 0.02% cinnamon, T3: basal diet with 0.02% virginiamycin.

enzyme in cholesterol synthesis (Singh et al., 2008; Mansoob, 2011). According to Case et al. (1995), 5% inhibition of HMG-CoA reductase lowers serum cholesterol in poultry up to 2 percent.

In the present study, the antibody titre increased significantly in the treated groups compared to the control. It has been previously shown that garlic supplementation causes a rise in antibody titre in blood. Haq et al. (1999) reported that garlic supplementation increased level of antibody titre against Newcastle disease in broiler. Similarly, Gabor et al. (1998) also found higher antibody response in response to garlic supplementation in broiler. Sadeghi et al. (2012) showed that the cinnamon and herbal mixture significantly improved the immune response to NDV vaccine in comparison to the control group.

Conclusion

The present study indicated that the results of medicinal plants in term of growth performance, blood cholesterol and antibody titre are parallel to antibiotics. Thus it is concluded that the medicinal plants could be used as alternative to antibiotics.

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References

- Al-Kassi, G.A.M. 2009. Influence of plant extracts derived from thyme and cinnamon on broiler performance. *Pakistan Veterinary Journal*, 29: 169-173.
- Ologhobo, A.D., Adebisi, F.G. and Adebisi, O.A. 2008. Effect of long term feeding of raw and sundried garlic (*Allium Sativum*) on performance and lipid metabolism of broiler chicks; Conference on International Research on Food Security, Natural Resource Management and Rural Development, Tropentag. 2008. University of Hohenheim, 7-9.

- Ciftci, M., Ulku, G., Simsek, Y., Yilmaz, A. and Bestami, O. 2010. Effects of dietary antibiotic and cinnamon oil supplementation on antioxidant enzyme activities, cholesterol levels and fatty acid compositions of serum and meat in broiler chickens. *Acta Veterinaria*, 79: 33-40.
- Case, G.L., He, L., Mo, H. and Elson, C.E. 1995. Induction of geranyl pyrophosphate pyrophosphatase activity by cholesterol suppressive isoprenoids. *Lipids*, 30: 357-359.
- Choct, M. 2001. Effects of organic acids, prebiotic and enzymes on control of necrotic enteritis and performance of broiler chickens. School of rural Science and Agriculture, University of New England.
- Elagib, H.A.A., El-Amin, W.I.A., Elamin, K.M. and Malik, H.E.E. 2013. Effect of dietary garlic (*Allium sativum*) supplementation as feed additive on broiler performance and blood profile. *Journal of Animal Science Advances*, 3: 58-64.
- Fadlalla, I.M.T., Mohammed, B.H. and Bakhiet, A.O. 2010. Effect of feeding garlic on the performance and immunity of broilers. *Asian Journal of Poultry Science*, 4: 182-189.
- Galib A.M., Al-Kassi N. and Witwit M. 2010. A comparative study on diet supplementation with a mixture of herbal plants and dandelion as a source of prebiotics on the performance of broiler. *Pakistan Journal of Nutrition*, 9: 67-71.
- Gabor, S., Vilmos, P., Bela, N., Istvanne, E., Gyorgy, S., Gabor, B. and Szabolcs, R. 1998. New type of immuno-stimulant to increase antibody production in response to viral and bacterial vaccines. *Magyar Allatorvosok Lapja*, 120: 719-721.
- Ghaedi, H., Nasr, J., Kheiri, F., Rahimian, Y. and Miri, Y. 2014. The effect of virginiamycin and black pepper (*Piper nigrum* L.) extract on performance of broiler chicks. *Research Opinion in Animal & Veterinary Science*, 4: 91-95.
- Haq, A., Meraj, K.A. and Rasool, S. 1999. Effect of supplementing *Allium sativum* (garlic) and *Azadirachta indica* (Neem) leaves in broiler feeds on their blood cholesterol, triglycerides and antibody titre. *International Journal of Agriculture and Biology*, 1: 125-127.
- Singh, M., Chauhan, S.S. and Kumar, P. 2008. Effect of supplementation of diets with BMD and Virginiamycin on the growth performance, carcass characteristics and bacterial population in broiler chickens. *Veterinary World*, 1: 141-143.
- Mansoub, H.N. 2011. Comparative effects of using garlic as probiotic on performance and serum composition of broiler chickens. *Annals of Biological Research*, 2: 486-490.
- Mansoub, H.N. and Nezhady, M.A.M. 2011. The effects of using Thyme, Garlic and Nettle on performance, carcass quality and blood parameters. *Annals of Biological Research*, 2: 315-320.
- Najafi, S. and Taherpour, K. 2014. Effects of dietary ginger (*Zingiber Officinale*), cinnamon (*Cinnamomum*), synbiotic and antibiotic supplementation on performance of broilers. *Journal of Animal Science Advances*, 4: 658-667.
- SAS Institute, SAS/STAT User's Guide for Personal Computer, 2001. Release 6.12 SAS Institute, Inc., Cary, N.C., USA.
- Sadeghi, G.H., Karimi, A., Padidar Jahromi, S.H., Azizi, T. and Daneshmand, A. 2012. Effects of cinnamon, thyme and turmeric infusions on the performance and immune response in of 1- to 21-day-old male broilers. *Revista Brasileira de Ciencia*, 14: 15-20.
- Scott, M.L., Nesheim M.C. and Young R.J. 1982. Nutrition of Chicken. W.F. Humphrey Press, Inc., Ithaca, N.Y.
- Teymourizadeh, Z., Shaaban, R., Karimi, T.M.A. and Beygir, O. 2009. The effects of *Thymus vulgaris* L., *Echinacea purpurea* (L.) moench, *Allium sativum* L. Extracts and virginiamycin antibiotic on intestinal microflora population and immune system in Broilers. *Iranian journal of Medicinal and Aromatic Plants*, 25: 39-48.