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EFFECT OF DIETARY HERBAL PLANTS SUPPLEMENT IN TURKEY DIET ON PERFORMANCE AND SOME BLOOD BIOCHEMICAL PARAMETERS

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ABSTRACT
A study was conducted to investigate the effect of adding the powder of garlic, ginger and cinnamon to the diet of turkey at a level of 5% on its performance and some blood parameters. A total of 56 unsexed turkeys of 28 old days were allocated into four dietary groups (14 birds each) in a complete randomized design. The groups were as follow: Control (basal diet), Garlic (5%), Ginger (5%), and Cinnamon (5%). The addition of garlic, ginger and cinammon had significant effects ($P<0.05$) on live body weight, weight gain, feed intake, feed conversion ratio (FCR) and organs weight (liver and gizzard) and dressing percentage expect of heart weight there is no significant effect ($P>0.05$). The adding garlic (5%), ginger (5%), and cinnamon (5%) to the turkey diets decreasing the AST, ALT and glucose levels. No difference was observed in cholesterol, total protein and creatinine.

KEY WORDS: Herbal plants, Turkey, Feed conversion, Creatinine.

INTRODUCTION

Growth promoters or feed additives are primarily included to improve the efficiency of the bird's growth and /or laying capacity, prevent disease and improve feed utilization. Among all growth promoters, the most commonly used are antibiotics, although nowadays their use is decreasing towards total extinction (Biovet and Laboratories, 2005). There are a number of non-therapeutic alternatives such as, inorganic acids, enzymes, prebiotics, probiotics, herbal plants, immunostimulants and other management practices (Banerjee, 1998). Medical plants and their principal secondary metabolites used extensively in food products, perfumery, dental and oral products due to their different medicinal properties (Suppakul *et al*., 2003). Ginger (*Zinziber officinale)* has been shown to have antimicrobial activity (Gardzielewska *et al*., 2003). The essential oils of *Zinziber officinale* showed antimicrobial activity against gram-positive and gram negative bacteria using the agar diffusion method (Martins *et al*., 2001). Garlic (*Allium sativum*) supplements in broiler chickens have been recognized for their strong stimulating effect on the immune system and very rich aromatic oils enhance digestion of birds (Gardzielewska *et al*., 2003). Cinnamon (*Cinnamomum cassia*) is commonly used in the food industry because of its special aroma. Additionally, it has strong antibacterial properties, anticandidial, antiulcer, analgesic, antioxidant and hypocholesterolaemic activities (Mastura *et al*., 1999) (Lin *et al*., 2003). Herbal plants improve feed intake and feed conversion ratio (Botsoglou *et al*., 2003). Herbal extracts have a role in stimulating digestive enzymes and may have an influence on lipid digestion and metabolism (Platel and Srinivasan, 1996). Plant extracts have been reported to reduce ileal pH value, while increasing the number of lactic acid bacteria in the ileum and caecal contents of broiler chickens, the caecal coliform and *C. perfringens* counts significantly decreased (Dalkilic *et al*., 2005; Vidanarachchi *et al*., 2006). Stimulation of favourable bacteria such as lactobacilli and bifidobacteria could contribute to a balanced gut microflora, and may provide an optimal precondition for effective protection against pathogenic microorganisms and intact immune system. Therefore, the present study was carried out to determine whether some selected plant would influence on performance and some blood parameters in turkey.

MATERIALS & METHODS

The dried ginger, garlic and cinnamon used in this experiment were obtained from the local market then ground into powder. Four diets were formulated to meet the nutrient required of the turkey, diets 1, 2, 3 and 4. Diet 1 served as a control, 0% (without any additives). Diet 2, 3 and 4 contained 5% ginger, garlic and cinnamon respectively. Fifty six unsexed turkeys at age 28th days were used for the study. The birds were divided into 4 groups (14 birds/group). Water and feed were provided *ad-labium*. Live body weight, weight gain**,** feed intake and feed conversion ratio (FCR) were calculated weekly. Mortality was recorded throughout the period of the study as it occurred. At the end of the experiment 3 birds per group were randomly selected, leg banded, weighed and slaughtered for carcass evaluation. Pre-slaughter weight, dressing weight was obtained to calculated dressing percentage for each bird.

TABLE 1: The ingredient and chemical composition (g/kg) of grower and finisher diets

Ingredients	Grower diet	Finisher diet
Soya bean meal (%46 CP)	112.30	98.16
Full-fat soyabean	200.00	200.00
Vitamin premix1	2.00	2.00
Mineral premix2	1.50	1.50
Salt	1.65	1.48
Crude Cotton oil	25.63	27.98
Anticcociadial	1.0	1.0
Antifungal	2.0	2.0
Total calculate analysis %		
Crude protein	23.09	20.95
ME kcal/kg	3337	3404
Calcium	1.0	0.90
Available phosphorus	0.48	0.48
Methionine + Cystine	0.95	0.94

The blood samples were taken from jugular vein during slaughtering and collected into tubes then allowed to clot and sera separated by centrifugation at 3000 rpm for 5 minutes. Serum glucose, cholesterol, total protein, creatinine, AST and ALT were determined by enzymatic calorimetric methods using Kits and semiautomatic chemistry analyzer. Data were analyzed using SPSS software. The significance of the differences among the groups was determined by Duncan's range test at a level of 5%.

RESULTS & DISCUSSION

Data presented in table 2 showed that garlic (5%) significantly ($P<0.05$) affected LBW at 4th, 5th, 6th and 8th weeks of age. While the ginger 5% significantly ($P<0.05$) affected at 4th, 5th, 7th and 8 weeks, also the cinnamon 5% significantly ($P<0.05$) affected at all the weeks expect the 8th week. These results agree with Sabra and Mehta, (1990) and Hassan *et al*. (2004). Using herbal plants as growth promoters in broiler diets was confirmed by Ebrahimi *et al*. (2013) who observed an improvement in the body weight gain, mortality rate and feed conversion. Other study reported that Cinnamon was significantly improved body weight at age of 28 day (Murray *et al*., 1991). The improvement in body gain could be due to the presence of fat soluble unidentified factors and essential fatty acids including linoleic, linolenic and arachidonic acids in medicinal plants for growth.

TABLE 2: Effect of dietary supplemental plant on average live body weight of turkey (g)

Age / Treat.	Week 4	Week 5	Week 6	Week 7	Week 8
Control	991.3 ± 34.9 b	1323.3 ± 30.6 b	2046.6 ± 28.4 ab	2745.2 ± 195.4 b	3638.6 ± 156.9 b
Garlic 5%	1093 ± 16.8 a	1400.1 ± 24.3 ab	2126.6 ± 20.9 a	2949.6 ± 194.7 bc	3944.3 ± 211.4 a
Ginger 5%	1043 ± 28.0 ab	1401.0 ± 21.5 ab	2050.0 ± 35.7 b	2962.6 ± 152.9 ab	3768.8 ± 208.5 ab
Cinnamon 5%	1011.6 ± 14.8 ab	1469.1 ± 23.4 a	2158.3 ± 58.7 ab	3070.0 ± 155.9 a	3608.3 ± 162.9 b

Differences in the same column with different superscripts are statistically significant at $P<0.05$

TABLE 3: Effect of dietary supplemental plant on average weight gain of turkey (g)

age / treatment	Week 4	Week 5	Week 6	Week 7	Week 8	Accumulative weight gain
Control	280.5 ± 8.80 a	332.0 ± 31.2 b	723.3 ± 32.0 ab	698.6 ± 94.8 bc	893.4 ± 94.0 ab	2927.8± 101.0 b
Garlic 5%	298.1 ± 31.2 a	307.1 ± 34.0 b	725.5 ± 18.0 a	823.0± 90.3 ab	994.7± 86.6 a	3148.4±89.9 a
Ginger 5%	358.1 ± 23.2 a	358.0 ± 15.9 b	649.0 ± 43.5 ab	912.6 ± 33.6 a	806.2 ± 98.5 ab	3083.9±97.3 a
Cinnamon 5%	325.0 ± 28.8 a	457.5 ± 26.8 a	689.2 ± 36.9 b	911.0 ± 47.6 ab	538.3 ± 98.7 b	2921.0±90.5 ab

Differences in the same column with different superscripts are statistically significant at $P<0.05$

Data present in table 3 showed that garlic, ginger and cinnamon not significant affected WG ($P>0.05$) at 4th week, while superior the cinnamon to garlic and ginger at 5th week, on 6th week showed that garlic significantly affected WG ($P<0.05$) and continuous on 7th and 8th weeks, while ginger significantly affected ($P<0.05$) with the garlic at 7th and 8th weeks, and this significant effect of plant supplement continued until the end of experiment.

This results agree with (Lee *et al*., 2004) and (Osama *et al*., 2005) found that adding cinnamon to broiler and turkey diets improve their growth performance. The improve of body weight gain due to the active materials (cinnamal-dehyde and ugenol) found in cinnamon, causing higher feed use efficiency and enhanced growth.

Feed consumption was significantly influenced by the dietary treatments (P<0.05) at 5th, 7th and 8th weeks. Treatments containing ginger, garlic and cinnamon improved feed intake, at the end of the experiment did not notice any significant differences between all groups. Our results agree with the findings of (Al-Kassie, 2009) that chicks fed with 200 ppm EO derived from thyme and cinnamon had significantly higher (P<0.05) feed intake, body weight gain and feed conversion ratio. Which may be due to active materials (ugenol and carracerol) in these plants which are considered as digestion and stimulating factors, in addition to their antimicrobial activity against bacteria found in the intestine (Cabuk *et al*., 2003).

TABLE 4: Effect of dietary supplemental plant on average feed intake of turkey (g/bird)

age / treatment	Week 4	Week 5	Week 6	Week 7	Week 8	Total feed intake
Control	292.8± 6.8 a	573.6± 27.6 b	917.2±45.6 a	1170.4± 54.8 b	1670.0± 65.2 b	4624.0±85.0 a
Garlic 5%	311.2± 7.4 a	577.6± 14.8 ab	885.6± 42.8 a	1201.2± 41.2 ab	1763.2± 58.0 a	4738.8±93.2 a
Ginger 5%	315.6± 7.3 a	573.2± 26.4 ab	928.8± 44.8 a	1281.2± 47.6 ab	1743.2± 61.6 ab	4842.2±101.3 a
Cinnamon 5%	291.2± 7.8 a	581.5± 12.1 a	978.8± 46.0 a	1318.8± 46.4 a	1704.8± 76.4 ab	4875.1±98.2 a

Differences in the same column with different superscripts are statistically significant at P<0.05

Feed conversion ratio was significantly influenced by the dietary treatments (P<0.05) at 6th and 8th weeks, this significant effect continued until the end of experiment at (P<0.05). Treatment containing garlic and cinnamon improved feed conversion. These results agree with (Botsoglou *et al*., 2003). Medicinal herbs improve feed intake and feed conversion ratio also agree with finding of (Shirzadegan, 2010) there is an evidence to suggest that herbs, spices and various plant extracts have appetite and digestion stimulating properties and antimicrobial effects (Kamel, 2001).

TABLE 5: Effect of dietary supplemental plant on average feed conversion ratio of turkey

age / treatment	Week 4	Week 5	Week 6	Week 7	Week 8	Total feed conversion
Control	1.31 ± 0.11 a	1.39 ± 0.22 a	1.38 ± 0.14 ab	1.62± 0.47 a	1.70 ±0.47 ab	1.69± 0.07 b
Garlic 5%	1.17 ± 0.20 b	1.08 ± 0.10 c	1.14 ± 0.71 bc	1.60 ± 0.43 a	1.60 ± 0.86 b	1.58±0.02 ab
Ginger 5%	1.14 ± 0.31 b	1.35 ± 0.18 b	1.41 ± 0.20 ab	1.55 ± 0.57 ab	1.69 ± 0.50 ab	1.75± 0.09 a
Cinnamon 5%	1.21 ± 0.25 b	1.10 ± 0.21 bc	1.48 ± 0.13 a	1.53± 0.58 ab	1.78 ± 0.18 a	1.95±0.05 a

Differences in the same column with different superscripts are statistically significant at P<0.05

Results of table 6 revealed that the inclusion of garlic and ginger improved the internal organs weight and dressing % significantly (P<0.05) compared with control. These results agree with the work of (Langhout, 2000), which showed that oil extracts could stimulate the digestion system in poultry, improve the function of liver and increase the pancreatic digestive enzymes. Enhancement of the metabolism of oil, carbohydrates and proteins in the major organs would increase growth rate of these organs (Mellor, 2000a; Mellor, 2000b).

TABLE 6: Effect of dietary supplemental plant on organs weight and dressing percentage of turkey

Treat. / Trait	Control	Garlic 5%	Ginger 5%	Cinnamon 5%
Heart weight (gm)	19.3±0.66 a	18.6±0.66 a	18.6±0.66 a	17.0±0.00 a
Liver weight (gm)	66.6±6.66 b	100.0±0.00 ab	153.3±17.6 a	80.0±11.5 b
Gizzard weight (gm)	86.6±6.66 b	93.3±6.66 ab	146.6± 6.66 a	86.6± 6.66 b
Dressing percentage	80.6±7.85 b	89.9±6.52 a	87.4±7.70 ab	91.9± 6.26 a

Differences in the same row with different superscripts are statistically significant at P<0.05

Data of serum constituent's analyses are summarized in table 7. Results indicated no insignificant effects of medicinal plants on cholesterol. This may be due to no effect of these medicinal plants on the enzyme which responsible to cholesterol in liver and this agree with (Hood *et al*., 1978) who explained there is no effect of medicinal plants on the level of cholesterol in the blood serum may be due to two reasons, either the effect which no inhibitor for HMC. COA reductase is responsible for cholesterol in liver or analysis of these plants rapidly in liver. No difference was observed in the total protein, this agree with (Abd El-Hakim *et al*., 2009) who found that there is no significantly affect (P<0.05) in albumin, globulin and total protein when using mixture of medicinal plants in broiler diets. This may be due to that medicinal plants do not have any role in stimulating humeral immunity and increase the numbers of lymphocytes type B which lead to increase immunoglobulins (Ali *et al*., 2008). Regarding serum glucose data revealed that there was a significant ($p<0.05$) reduction in turkey groups fed on garlic 5% and ginger 5%. These result supported by the data obtained by (Lemhadri, 2004) who reported than an aqueous oregano extract exhibits an anti-hyperglycemic activity in STZ rate without affecting basal plasma insulin concentration. There is effected significant ($p<0.05$) reduction in serum of dietary garlic 5%, Ginger 5% and cinnamon 5% on SGOT and SGPT of turkey in different groups and this agree with (Soltan *et al*., 2008) Generally GOT and GPT considered as liver enzyme which increased with liver damage (heptatocellular degeneration), so the decrease in SGOT and SGPT may provide evidence for the occurrence of hepatoprotective effect of anise and its essential oil (Langhout, 2000; Williams and Losa; 2001; Hernandez *et al*., 2004).

TABLE 7: Effect of dietary supplemental plant on some serum parameters of turkey

Param \ Treat	Control	Garlic 5%	Ginger 5%	Cinnamon 5%
Cholesterol (mg/100ml)	192.8 ±34.16 a	186.8 ± 41.22 a	278.5 ± 32.62 a	184.1 ± 27.54 a
Total protein gm/100 mL	0.2 ± 0.03 a	0.2 ± 0.01 a	0.2 ± 0.01 a	0.1 ± 0.20 a
Creatinine mg/dL	0.3 ± 0.05 a	0.2 ± 0.03 a	0.2 ± 6.00 a	0.2 ± 0.03 a
Glucose mg/dL	91.1 ± 11.92 b	63.7 ± 15.14 a	57.1 ± 17.14 a	82.5 ± 16.87 ab
ALT IU/L	987.8± 8.03 b	969.6 ± 20.75 a	972.4 ± 21.30 ab	958.6 ± 19.34 a
AST IU/L	1041.6 ± 2.94 b	1019.7 ± 22.51 a	1038.5 ± 4.94 ab	1039.8 ± 5.02 ab

Differences in the same row with different superscripts are statistically significant at P<0.05

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