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Effect of Dietary Incorporation of Aniseed (*Pimpinella anisum*) and Ginger (*Zingiber officinale*) Rhizome Powder and their Combination on Haemato-biochemical Parameters and Carcass Trait in Broiler Chicken

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ABSTRACT

A feeding trial was conducted to discern the effect of aniseed and ginger rhizome powder as feed additive on haemato-biochemical parameters and carcass traits in Ven Cobb 400 strain of broiler chicken. Day old 120 chicks were procured and randomly distributed into four treatment groups. Each treatment had 3 replicates with ten chicks in each replicate. The control group (T_1) were fed basal diet without any supplementation. In treatment groups T_2, T_3 and T_4, basal diet was incorporated with 1.0 % aniseed powder, 1.0 % ginger rhizome powder and 0.5 % aniseed + 0.5 % ginger rhizome powder, respectively. The haematological parameters were not affected due to dietary incorporation of aniseed and ginger rhizome powder. A significant ($P<0.05$) reduction in serum cholesterol in treatment groups T_4, T_3 and T_2 as compared to control T_1 however, there was also considerable reduction in serum triglycerides content in T_2, T_3 and T_4 group. Dressing percentage, weight of cut up parts and giblet showed no significant difference among the group but there was significant ($P<0.05$) increase in gizzard in broiler chicks due to aniseed and ginger rhizome powder supplementation. There was significant ($P<0.05$) increase in ether extract content of breast muscles in T_2 group. There was significant increase in protein content of thigh muscle in T_3 and T_4 group. It is concluded that inclusion of 1.00 % aniseed or 1% ginger rhizome powder in the diet of broiler improved meat quality by reducing cholesterol level in meat of broiler chicken.

HIGHLIGHTS

- Effect of aniseed and ginger rhizome powder incorporation on haemato-biochemical and carcass traits of broilers was studied.
- Serum cholesterol content decreased with inclusion of aniseed and ginger rhizome power in the diet

Keywords: Aniseed, Broiler chicks, Carcass traits, Ginger rhizome powder, haemato-biochemical parameters.

The fast-growing nature of broilers and their short generation interval has been associated with the use of antibiotic growth promoters in animal feeds. However, the use of antibiotics in the diet is restricted because of their residual effect on birds and in turn adverse effect on human health, environmental hazards and subsequent resistance to bacteria (Joshi *et al.,* 2015). Now a day's current research is focused to improve feed conversion ratio and growth rate of birds using useful herbs and herbal preparations as an alternative to antibiotics (Manesh, 2012). Aniseed contains trans-anethole, methylchavicol (Estragole), eugenol, psedoisoeugenol, anisaldehyde. Anethole also inhibits growth of mycotoxin produced by *Aspergillus* species. Anethole, anisaldehyde and myristicin in aniseed, along with d-carvone (present in *P. anisum* plant), have been found to have mild insecticidal properties (Leung and Foster, 2011). Aniseed has the ability to improve digestive enzymes by enhancing utilization of nutrients, preventing the growth and activity of pathogenic

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microorganisms. Pharmacological studies were carried out in broilers, and anise oil showed significant antipyretic activities in rats (Afifi *et al.*, 2014). Aniseed is used to treat dyspeptic and catarrh of the respiratory tract, and as mild expectorants. It was also reported that extracts from anise fruits have therapeutic effects on several conditions, such as gynaecological and neurological disorders (Lawless, 2010). The most important phytochemical compounds present in ginger are gingerol, gingerdiol and gingerdione which have the ability to stimulate digestive enzymes for enhancing utilization of nutrients, preventing the growth and activity of pathogenic microorganisms in the gut and possess anti-oxidative activity (Dieumou *et al*., 2009; Platel and Srinivasan, 2017). It is reported that ginger has lipid-lowering effects, antioxidant and anti-atherosclerotic properties (Shirin and Prakash, 2010). The ginger preserves the lipid-based feeds due to the prevention of auto-oxidation of linoleic acid by gingerol (Kikuzaki and Nakatani, 2014), improves the shelf-life of meat (Ziauddin *et al*., 2013) and fermented meat sausage (Al-Jalay *et al*., 2011).

MATERIALS AND METHODS

The present study was carried out at Instructional Poultry farm, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar. Uttarakhand, India. A total of 120, day-old commercial broiler chicks (Ven Cobb 400 strain) were procured from R. K. poultry, Bajpur, Uttarakhand and randomly divided into 4treatment groups with three replicates having 10 chicks in each replicate. The broiler chicks were housed in a deep litter system and provide *ad lib.* Starter (0-3 weeks) and finisher (3-6 weeks) feeds (Table 1) and water throughout the trail period of 0-42 days to all the broiler chicks so as to meet the nutrient requirements as per BIS (2007). The basal diet was analyzed for proximate principles as per standard methods (AOAC, 2000). The broiler chicks were raised in a deep litter system under standard management condition.

Blood sample were collected from six experimental birds of each group i.e., two broiler chicks from each replicate. For haematological parameters, 3.0 ml blood were collected from the wing vein with sterile needle into well labeled blood collecting test tubes containing EDTA as anticoagulant while for analysis of biochemical parameters, blood samples were collected in sterile tubes without anticoagulant for collection of serum. The serum was separated by centrifugation at 2000 rpm for ten minutes and stored at -20^{o}C until further analysis. The haematological parameters *viz.,* haemoglobin, packed cell volume, mean corpuscular volume, mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration in blood were estimated as per the methods described by Sharma and Singh (2000) whereas total erythrocyte count and total leucocyte count were done using Neubauer's chamber Jain (1986). The Serum cholesterol (Tietz, 1998), triglycerides McGowan *et al.* (1983) and (Fossati, and Prencipe 1969), glucose (Sacks, 1998), total protein albumin (Johnson *et al*., 1999). Were determined using Erba Diagnostic Kits. The activity of serum alanine amino transferase (ALT), aspartate amino transferase (AST) was estimated by using Ecoline Diagnostic kits using the methods of (Bergmeyer *et al*., 1986).

Table 1: Ingredient and chemical composition (%) of basal diet of broiler starter and finisher diets

Ingredients	Broiler starter (0 -3 weeks)	Broiler finisher (3 – 6 weeks)
Maize	53.00	56.00
Deoiled soyabean meal	36.00	32.00
Vegetable oil	1.00	2.00
Rice polish	3.55	3.55
Groundnut cake	3.00	3.00
Lysine	0.20	0.20
DL-methionine	0.30	0.30
Dicalcium phosphate	1.50	1.50
Trace mineral mixture	0.50	0.50
Common salt	0.40	0.40
Vitamin premix	0.35	0.35
Coccidiostat	0.05	0.05
Hepatocare	0.10	0.10
Choline chloride	0.05	0.05
Chemical Composition		
Dry matter	94.52	93.20
Crude protein	22.17	20.21
Ether extract	5.50	5.00
Crude fibre	4.40	4.30
Ash	6.20	7.70
Nitrogen-free extract	61.73	62.79

The carcass characteristics were studied on 6 broiler chicks from each group i.e., 2 chicks from each replicate slaughtered at the end pf feeding trails. The live weight and individual weight after slaughter of chicks was recorded

and based on these data, dressing weight, weight of cut up parts and giblets were calculated. Proximate composition (moisture, fat and protein) of broiler meat was determined (AOAC, 2000). The sensory quality of meat samples was evaluated by meat descriptive analysis method (Keeton and Feeding, 1984).

The experimental data obtained during the study were analyzed statistically using completely randomized design with the simple analysis of variance (ANOVA) technique (Snedecor and Cochran, 1994).

RESULTS AND DISCUSSION

The values of haematological and serum biochemical parameters have been presented in Table 2. There was no significant difference (P<0.05) in haematological parameters viz., haemoglobin, packed cell volume, total erythrocyte count, total leucocyte count, mean corpuscular volume, mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration among different treatment group. The haematological parameters in various group were similar and in the normal range Zomrawi *et al*. (2011, 2013) and Mangal (2016).

The mean serum cholesterol concentration in group T_2, T_3 and T_4 was lower (P<0.05) as compared to control (T_1). The reduction in serum cholesterol concentration due to dietary aniseed and ginger rhizome powder might be due to the possible mechanism of hypocholestrolaemic action of active principles present in ginger rhizome powder which stimulate hepatic cholesterol-7-hydroxylase enzyme which converts cholesterol to bile acids, facilitating the biliary cholesterol excretion Babu and Srinivasan (1997). Similar resultswere also reported by Jamel *et al.* (2010), Khajeali *et al*. (2012) and Al-Shammari *et al.* (2017). The serum

Table 2: Average values of haemato-biochemical constituents in broiler chicks fed diets incorporated with aniseed and ginger rhizome powder (42nd day)

Parameters	Treatments/ Groups				SEm	CD at 1%	CD at 5%
	T_1	T_2	T_3	T_4			
	Control (without aniseed and ginger rhizome powder)	1.0% Aniseed powder	1.0% Ginger rhizome powder	0.5 % Aniseed + 0.5 % Ginger rhizome powder			
Haemoglobin (%)	8.55±0.24	8.43±0.19	8.73±0.58	8.67±0.57	0.43	2.05	1.41
Packed cell volume (%)	30.96±2.24	25.50±1.53	26.67±1.30	29.61±2.43	1.93	9.15	6.30
Total erythrocyte counts (10^6 /µl)	2.59±0.04	2.64±0.06	2.62±0.04	2.63±0.05	0.047	0.22	0.15
Total leukocyte counts (10^3 /µl)	24.08±0.36	24.52±1.29	23.75±0.29	23.17±0.46	0.72	3.42	2.35
Mean corpuscular volume (fl)	119.62±7.33	97.04±7.86	102.23±6.33	113.18±10.93	8.29	39.27	27.03
Mean corpuscular haemoglobin (pg)	33.09±1.11	32.07±1.38	33.49±2.67	33.00±1.78	1.83	8.68	5.98
Mean corpuscular haemoglobin concentration (g/dl)	27.88±1.75	33.29±1.22	32.72±0.56	29.74±2.84	1.80	8.51	5.86
Haemoglobin (%)	8.55±0.24	8.43±0.19	8.73±0.58	8.67±0.57	0.43	2.05	1.41
Cholesterol (mg/dl)*	166.03^a±5.56	143.75^b±6.58	138.98^b±5.50	149.59^b±2.42	5.25	24.88	17.12
Triglyceride(mg/dl)	61.05±4.84	53.33±1.36	51.37±2.61	57.78±3.96	3.46	16.36	11.26
Glucose (mg/dl)	157.43±1.04	163.11±1.40	160.51±2.64	160.03±3.20	2.25	10.65	7.33
Total protein (g/dl)	3.36±0.14	3.26±0.16	3.35±0.16	3.38±0.15	0.15	0.73	0.50
Albumin (g/dl)	1.50±0.02	1.57±0.18	1.58±0.08	1.47±0.08	0.10	0.51	0.35
Globulin (g/dl)	1.86±0.12	1.69±0.19	1.77±0.17	1.91±0.18	0.17	0.79	0.55
Serum glutamate pyruvate transaminase (U/L)	25.05±3.72	26.08±3.81	25.93±4.85	25.34±2.62	3.83	18.14	12.49
Serum glutamate oxaloacetate transaminase (U/L)	163.25±5.11	168.40±0.88	160.00±3.01	160.89±4.86	3.86	18.28	12.58
Serum Alkaline phosphatase (U/L)	84.53±1.51	85.91±1.64	83.10±0.98	80.02±3.20	2.01	9.54	6.56

[a,b] values bearing the different superscripts in a row differ significantly from each other, * P<0.05.

triglycerides concentration reduced non-significantly in (T_3), (T_2) and (T_4) group respectively, as compared tocontrol (T_1). These observations corroborated with those of Christaki *et al.* (2011), Barazesh *et al.* (2013), Zomrawi *et al.* (2013), Mohammed *et al.* (2014) and Mangal (2016) where in dietary aniseed and ginger powder supplementation did not affect significantly on serum triglycerides level which was in accordance with the results of present study. The serum total protein, albumin, globulin and albumin: globulin ratio of broiler chicks was not influenced by dietary aniseed and ginger rhizome powder incorporation. However, Al-Shammari *et al.* (2017) and Zomrawi *et al.* (2011) reported that ginger and aniseed powder significant effect on serum triglycerides level.

There were no significant influence of aniseed and ginger rhizome powder in the diet of broiler chicks on the activities of Serum glutamate pyruvate transaminase, serum glutamate oxaloacetate transaminase and ALP enzymes. These enzymes are a relatively specific indicator of acute liver cell damage and pathological manifestation of liver dysfunction Toghyani *et al*. (2011). The results are similar with the findings of Soltan *et al.* (2008) and Georgi *et al.* (2015b) who reported that dietary aniseed and ginger rhizome powder did not show significant effect on SGPT and SGOT enzymes activity. Georgi *et al.* (2015a) also reported that inclusion of ginger powder to broiler chickens diet had no significant effect on ALP enzyme activity.

Table 3: Average values of cut-up parts of finisher broilers (% of live weight) fed diets incorporated with aniseed and ginger rhizome powder

Parameters	Treatments/ Groups				SEm	CD at 1%	CD at 5%
	T_1	T_2	T_3	T_4			
	Control (without aniseed and ginger rhizome powder)	1.0% Aniseedpowder	1.0% Ginger rhizome powder	0.5 % Aniseed + 0.5 % Ginger rhizome powder			
Dressing percentage	64.74±0.64	66.33±0.60	64.77±0.65	66.38±0.26	0.56	2.66	1.82
Cuts-up parts (% of live weight)							
Neck	3.61±0.13	3.63±0.08	3.62±0.08	3.43±0.18	0.12	0.58	0.40
Wing	6.33±0.12	6.29±0.11	5.98±0.09	6.31±0.11	0.11	0.51	0.35
Back	10.78±1.71	9.54±0.03	9.53±0.13	9.72±0.22	0.86	4.09	2.82
Breast	22.87±1.10	24.65±0.77	24.47±0.76	25.40±0.47	0.81	3.81	2.63
Thigh	9.89±0.63	10.52±0.15	9.81±0.30	9.97±0.18	0.37	1.73	1.20
Drumstick	10.15±0.12	10.11±0.22	9.79±0.15	9.83±0.19	0.17	0.82	0.56
Organ weight (% of live weight)							
Heart	0.49±0.01	0.52±0.02	0.56±0.03	0.52±0.04	0.03	0.12	0.08
Liver	1.88±0.07	2.00±0.05	2.08±0.03	2.06±0.12	0.07	0.35	0.24
Gizzard*	1.99^{b}±0.03	2.25^{a}±0.04	2.18^{ab}±0.13	2.40^{a}±0.06	0.07	0.39	0.24
Spleen	0.08±0.00	0.06±0.01	0.07±0.00	0.08±0.01	0.004	0.02	0.02
Processing losses (% of live weight)							
Blood loss	2.53±0.42	2.51±0.29	3.19±0.41	2.07±0.51	0.42	1.98	1.36
Feather loss	6.24±0.11	6.46±0.23	6.39±0.29	6.42±0.28	0.24	1.13	0.78
Head	2.13±0.23	2.27±0.11	2.37±0.04	2.70±0.17	0.16	0.73	0.50
Shank	4.33±0.13	4.04±0.15	4.43±0.16	4.10±0.07	0.13	0.62	0.43
Abdominal fat	1.08±0.04	1.27±0.10	1.22±0.05	1.10±0.06	0.07	0.30	0.21
Chemical composition							
Breast muscle							
Dry matter (%)	28.13±1.94	25.98±0.39	27.33±1.00	26.60±0.20	1.11	5.27	3.62
Crude protein (%)	76.31±0.86	78.44±1.76	81.29±0.44	80.66±1.30	1.20	5.66	3.90
Ether extract (%)**	4.25^{c}±0.53	7.98^{a}±0.28	5.07^{bc}±0.38	5.53^{b}±0.24	0.37	1.76	1.20
Thigh muscle							
Dry matter (%)	24.38±2.05	27.26±0.20	27.03±0.47	27.82±0.32	1.07	5.06	3.48
Crude protein (%)	64.33^{c}±0.87	66.51^{c}±1.00	73.82^{a}±0.14	70.05^{b}±1.30	0.93	4.39	3.02
Ether extract (%)**	21.03±0.50	21.02±0.09	20.33±0.87	19.05±0.17	0.51	2.41	1.66

^{a,b,c} values bearing the different superscripts in a row differ significantly from each other, * $P<0.05$.

The carcass characteristics *viz*., dressing percentage and cut-up parts *viz*., neck, wing, back, breast, thigh and drumstick and organs weights such as heart, liver and spleen were found statistically similar among the different treatment's groups (Table 3). However, there was significant difference in the gizzard weight as per cent of live weight among different treatment groups of broilers. The gizzard weight in broilers fed diets incorporated with 0.50% aniseed + 0.50% ginger rhizome powder T_4 was significantly maximum (2.40%) and it was minimum (1.99%) in control group of broiler chicks. Similar to the present findings, Ebrahimnezhad *et al*. (2014), Huda (2015) and Mangal (2016) reported that ginger rhizome powder supplementation in the diet of broiler chicks had no significant effect on carcass characteristics. Simsek *et al.* (2007) reported that aniseed powder had significant effect on carcass characteristics of broiler chickens. They found significant improvement in hot and cold carcass yield and gizzard and liver weights due to supplementation of anise oil in the diet of broiler chicks, whereas other parameters for carcass characteristics were not affected. On the contrary, Soltan *et al.* (2008), Amad *et al.* (2011), Hamdan and Mukhtar (2017) reported that aniseed powder had significant effect on dressing percentage and commercial carcass cut-up parts (breast, drumstick and thigh) of broiler chickens. Eltazi (2014a) found improved dressing percentage and commercial carcass cut-up parts (breast, drumstick and thigh) by using ginger powder as a feed additive at the level of 1% in the diet of broiler chickens.

The dry matter content of breast and thigh muscles of broilers were not influenced by aniseed and ginger rhizome powder incorporation in the diet of broilers (Table 3). However, there was significantly ($P<0.05$) influenced by ginger rhizome powder supplementation (T_2 and T_4) in basal diets. The ether extract contents of breast muscles of treatment groups T_1, T_2, T_3 and T_4 were 4.25, 7.98, 5.07 and 5.53 per cent on dry matter basis, respectively. The mean crude protein content in thigh muscles of broiler chickens was significantly ($P<0.05$) influenced by ginger rhizome powder supplementation (T_3 and T_4) in basal diets. The crude protein content of thigh muscles in broilers of different treatment groups T_1, T_2, T_3 and T_4 was 64.33, 66.51, 73.82 and 70.05 per cent, respectively, on dry matter basis. Significantly maximum crude protein content was recorded in treatment group T_3 followed by T_4 and minimum in T_1. The aniseed powder supplementation had no significant effect on crude protein content of thigh muscles. The results of this study are in concurrence with those of Mangal (2016) who revealed that dietary incorporation of ginger rhizome powder resulted in significantly higher protein content in thigh muscle of broiler meat compared with control group.

Sensory characteristics *viz.,* appearance, flavour, texture and overall acceptability of meat did not differ significantly among various treatment (Table 4). However, the juiciness of broilers meat showed significant difference among the different treatment groups due to supplementation of aniseed and ginger rhizome powder. The juiciness of meat of broilers was 6.56, 6.31, 6.37 and 6.31, respectively, in treatment groups T_1, T_2, T_3 and T_4 which showed decreasing effect in juiciness of meat due to inclusion of aniseed and ginger rhizome powder

Table 4: Average values for sensory characteristics of meat of broiler chicks fed diets incorporated with aniseed and ginger rhizome powder

Parameters	Treatments/ Groups				SEm	CD at 1%	CD at 5%
	T_1	T_2	T_3	T_4			
	Control (without aniseed and ginger rhizome powder)	1.0% Aniseedpowder	1.0% Ginger rhizome powder	0.5 % Aniseed + 0.5 % Ginger rhizome powder			
Appearance/colour	6.56±0.03	6.44±0.12	6.62±0.15	6.31±0.01	0.10	0.46	0.32
Flavour	6.62±0.04	6.50±0.10	6.37±0.07	6.49±0.10	0.08	0.38	0.26
Juiciness*	6.56^{a}±0.09	6.31^{b}±0.01	6.37^{b}±0.07	6.31^{b}±0.01	0.06	0.27	0.18
Texture	6.50±0.10	6.50±0.10	6.43±0.14	6.62±0.15	0.12	0.59	0.40
Overall acceptability	6.68±0.04	6.50±0.10	6.43±0.14	6.50±0.10	0.10	0.48	0.33

^{a,b} values bearing the different superscripts in a row differ significantly from each other, * $P<0.05$

alone or in combination in comparison to control group. Which is in agreement with the findings of Huda (2015) and Mangal (2016) reported that adding ginger powder to the basal experimental diet of broiler chicks did not affect sensory characteristics of broiler meat. Eltazi (2014b) found that increased tenderness score of both thigh and breast muscles due to aniseed powder inclusion in the diet as compared to control group of broiler chicks.

CONCLUSION

It could be concluded that incorporation of aniseed and ginger rhizome power of feed of broiler chicks reduced serum cholesterol and triglyceride contents and improved broiler meat quality by increasing protein content in thigh muscle without inducing any abnormal colour or flavour.

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