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Running head: *ALLIUM SATIVUM*SUPPLIMENTATION ON BLOOD CHEMISTRY OF BROILERS

Effect of Garlic Powder (*Allium sativum*) Supplimentation on Haemato-biochemical profile of Broilers

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Abstracts

An experiment evaluate the beneficial effects of garlic powder as a phytogenic supplement on broilers chickens' blood profile. A total of 105 one-day-old chicks of mixed sex (Vencob) were weighed and randomly assigned to five treatment groups, each with three replicate pens of 21 chicks. The dietary treatments included the basal diet (control; T_0), control + 5 g/ kg garlic (T_1), control + 10 g/ kg garlic (T_2), control + 20 g/ kg garlic (T_3) and control + 30 g/ kg garlic (T_4) as powder. The results of the study revealed that incorporation of garlic powder in broiler diets as feed additive significantly lower cholesterol, Triglyceride, LDL, and, VLDL levels compared with control group. However, increasing glucose, HDL andprotein. Based on the finding of experiment, it can be inferred that garlic can be added to broiler diets due to their positive effect on blood serum profile chickens. The optimum inclusion rate of garlic for improving serum profile was found upto 3.0 per cent

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Poultry scientists and nutritionists are searching for suitable additives because traditional supplements have been criticized for adverse effects on the food chain (Khan et al., 2012). The use of chemical feed additives to promote growth is critical because of adverse effects on consumer's health. In this view, herbal and plant derivatives are an useful choice for supporting poultry growth and health. Garlic (*Allium sativum* L.) is one of the most traditionally used plants as a spice and herb. The utility of *Allium sativum* has been known for 5000 years (Pistovaet al., 2016). Garlic contains around 33 substances, including arsenic, enzymes and amino acids, minerals and selenium (El-Gogary et al., 2019). A variety of bioactive organosulfur compounds have attributed the chemo-preventive ability of garlic. The main bioactive components in garlic are its organosulfur compounds, such as allicin (Shanget al., 2019), diallyl sulphide (Gomez-Gomez et al., 2017) and diallyltrisulfide (Mansinghet al., 2018) etc. that may be responsible for the healing effect of garlic (Togashiet al., 2008). Garlic is today use for a variety of reasons, it has anti-microbial, anti-bacterial, anti-inflammatory effects etc. (Fanelliet al., 1998; Siegers et al., 1999, Mansoub, 2011). Previous studies showed that the effects of inclusion of garlic in poultry diets to improve the profile of blood lipids and tissues (Stanacev et al., 2011). Garlic has been described as a natural additive that improved broiler performance (Stanacev et al., 2011). The purpose of this study was to determine the effect of *Allium sativum* on blood chemistry of broiler chickens.

Material and Methods

This study was conducted atDepartment of Animal Husbandry and Dairy Science, Dapoli, Dr. B.S. Konkan Krishi Vidyapeeth Dapoli, Dist. Ratnagiri, Maharashtra. The

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Vol-22-Issue-34-December -2019

experiment was performed with broiler chicks of 105 days old '*Vencob*'. The chicks were allocated into five treatments with three replications (21 chicks/treatment). The chicks were kept under special care and management in a brooder for a week. The experimental feed was designed to fulfill the requirements of birds as per National Research Council's (NRC 1994).

For each procedure, a basal or control diet was formulated and then garlic powder was added individually according to the treatment needed and thoroughly combined. Until the age of 5 weeks, the birds are fed *ad libitum*. Each diet with garlic was fortified according to the requirement per kg of feed. The treatments assigned were: T_0(0.0 % garlic powder), T_1(basal diet + 5 g garlic powder/ kg of feed), T_2(basal diet + 10 g garlic powder/ kg of feed), T_3(basal diet + 20 g garlic powder/ kg of feed) and T_4 (basal diet + 30 g garlic powder/kg of feed). For analysis of blood profile of chickens, three birds were selected randomly from each treatment on 36 days. The blood was collected from the wing vein on the inner side of the elbow joint in the sterilized test tubes and were subjected to determination of different parameters, *viz.*, serum glucose, haemoglobin, cholesterol (Godkar, 1994), serum protein, low density lipoprotein (Friedwald*et al.*, 1972), high density lipoprotein (Richmond, 1973) and serum triglycerides (Godkar, 1994). The Statistical analysis was carried out on the data (Snedecor and Cochran, 1994).

Results and Discussion

Chemical composition of experimental feed

The chemical composition of commercial broiler starter, broiler finisher and garlic powder are presented in Table 1. The dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE), nitrogen free extract (NFE) and ash was found as 90.33, 21.87, 6.56, 4.46, 60.67 and 6.43 per cent, respectively in broiler starter and in case of finisher as 89.10, 18.95, 6.23, 4.25, 65.37 and 5.2 per cent, respectively.Similarly,garlic powder contained 86.23,

ISSN:0971-1260
Vol-22-Issue-34-December -2019

16.04, 3.5, 3.45, 67.61 and 9.4 per cent of dry matter, crude protein,crude fiber,crude fat, nitrogen free extractand total ash, respectively. The finding of present experiment are agreement with Fadlalla*et al.* (2010) for chemical composition of garlic.

Haemato-biochemical profile

Haemoglobin (Hb)

Table 2 shows the results of the effect of different levels of garlic on the haemoglobin (mg/dl) content. Birds fed 0.2 percent of the basal diet of garlic powder ($p<0.05$) had significantly higher haemoglobin (11.20 mg / dl) compared to the rest of the diet. Thus, there was significantly increased in serum haemoglobin values in all dietary treatments as compared to control group.The present results are in agreement with Ademola*et al.* (2009) found that 1.5 per cent garlic powder in broilers diet improve haemoglobin in blood.

Serum glucose

The average serum glucose values (mg/dl) of different dietary treatment groups are presented in Table 2. From the data, it was showed that the average serum glucose was 213.34, 238.70, 270.70, 247.11 and 229.92 mg/dl for the treatments T_0, T_1, T_2,T_3 and T_4, respectively. Thus, there was significantly highest ($p< 0.05$) serum glucose values found in treatment T_2 (270.70 mg/dl) as compared to other treatments. This might be due to increased level of garlic herbal feed addition in the diet. The results presented are in line with Horton *et al.* (1991) in broilers fed with 10000 mg/kg dried garlic improve plasma glucose (241.94 mg/dl) in blood than control.

Serum cholesterol

The average values of serum cholesterol (mg/dl) of treatment groups are presented in Table 2. Results showed that the average serum cholesterol was 175.94, 173.49, 170.29,

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Vol-22-Issue-34-December -2019

162.26 and 153.43 mg/dl for the treatments T_0, T_1, T_2,T_3 and T_4, respectively. The significant lower value of serum cholesterol was recorded in T_4 (153.43 mg/dl) as compared to other treatments and T_0 (175.94 mg/dl). It may be due to the fact that blood and tissue levels of cholesterol are calculated by balancing dietary inputs and body synthesis on the one side and bile acid oxidation on the other. Any clinical changes in blood cholesterol levels must therefore be due to changes in one or more of these input-output factors. Similar findings were reported by Jimoh*et al*. (2012) fed broilers with 2.5 g kg^{-1} garlic recorded serum cholesterol (106.45 mg/dl) as compared to control (133.40 mg/dl). Kim *et al*. (2008), Kamal (2011), Faghani*et al.* (2014), Horton *et al.* (1991) and Ademola*et al*. (2009) also observed that reduction of serum cholesterol by addition of different levels of garlic in broilers diet.

High Density Lipoprotein Cholesterol

Table 2 shows the average serum levels of high density lipoprotein (HDL) cholesterol (mg / dl) in various groups. From the results, it was revealed that the HDL was 61.67, 67.88, 70.34, 76.96 and 82.71 mg/dl for the groups T_0, T_1, T_2,T_3 and T_4, respectively. There was significantly increment in high density lipoprotein cholesterol values in T_4 (82.71 mg/dl) as compared to control. The present results are in agreement with Faghani*et al*. (2014) found that high density lipoprotein higher in the blood of birds fed garlic powder was 62.34 mg/dl than control 58.46 mg/dl. Other similar finding also recorded by Prasad *et al.* (2009), Kamal (2011) and Ademola*et al*. (2009) found that garlic was effectively increased the high density lipoprotein in blood.

Low Density Lipoprotein (LDL) Cholesterol

The average serum low density lipoprotein (HDL) cholesterol values (mg/dl) in different groups are presented in Table 2.From the data, it was revealed that the LDL was 94.21, 86.30, 81.09, 67.40 and 53.98 mg/dl for the groups T_0, T_1, T_2,T_3 and T_4, respectively.

ISSN:0971-1260
Vol-22-Issue-34-December -2019

Statistical analysis of data revealed that the average LDL cholesterol value of group supplemented with herbal feed was significantly decreased ($p< 0.05$) than control group thus, herbal feed additives effectively reduces LDL cholesterol. Similar findings were recorded by Choi *et al*. (2010). They observed that the reduction in serum LDL cholesterol values in 5 per cent garlic powder was higher than control. Kim *et al*. (2008), Kamal (2011) and faghani*et al*. (2014) also reported that garlic decrease low density lipoprotein in the blood.

Very Low Density Lipoprotein Cholesterol (VLDL)

Table 2 shows the results of the effect of feeding graded levels of garlic on the content of VLDL (mg / dl). Statistical analysis revealed that the average VLDL cholesterol value of group T_4 (16.74 mg/dl) was significantly decreased ($p < 0.05$) than control (20.05mg/dl) and other treatment groups. Control treatment was higher than other treatments thus, addition of herbal feed in the broiler's diet effectively reduce VLDL cholesterol. The results of present experiment are agree with Choi *et al*. (2010).

Serum triglyceride

The average value of serum triglyceride (mg/dl) are shown in Table 2. From the data, it was observed that the serum triglyceride was 100.28, 96.52, 94.33, 89.47 and 83.70 mg/dl for the groups T_0, T_1, T_2,T_3 and T_4, respectively. It was revealed that the average serum triglyceride value of group T_4 (83.70 mg/dl) was significantly lower than all treatment groups. Hence, herbal feed additives might be effectively reducing triglycerides. The present findings were in agreement with Kamal (2011) reported that the 0.2 per cent garlic powder was lowers the serum triglycerides than control.

Serum protein

ISSN:0971-1260
Vol-22-Issue-34-December -2019

The average value of the serum protein (mg/dl) of treatment groups are showed in Table 2. From the data, it was found that the average serum total protein was 2.86, 3.08, 3.19, 3.56 and 2.94, mg/dl for the treatments T_0, T_1, T_2,T_3 and T_4, respectively. Thus, there was significant increased ($p<0.05$) in serum total protein values in treatmentT_3 (3.56 mg/dl) as compared to other treatments. The results presented are in line with Fadlalla*et al.* (2010). They reported that 0.60 per cent garlic (3.31 mg/dl) increased effectively serum protein than control (2.86). Similar, findings also recorded by Onu (2010) supplemented diets 0.25 per cent garlic having higher protein 35.01 g/dl than control was 33.82 g/dl in broilers.

Conclusion

It can be concluded, based on the present results, that garlic powder (*Allium sativum* L.), has a positive effect on serum blood chemistry of broiler. Therefore, from the results of experiment it can be suggested that inclusion of garlicpowder upto 3.0 per cent are optimum for improving serum profile of broilers.

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ISSN:0971-1260
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ISSN:0971-1260
Vol-22-Issue-34-December -2019

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ISSN:0971-1260
Vol-22-Issue-34-December -2019

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Table 1. Chemical composition of experimental feed ingredients (per cent DM basis).

Sr. No.	Attributes	Broiler starter	Broiler finisher	Garlic powder
1	**Dry matter**	90.33	89.10	86.23
2	**Crude protein**	21.87	18.95	16.04
3	**Crude fiber**	6.56	6.23	3.50
4	**Crude fat**	4.46	4.25	3.45
5	**Nitrogen free extract**	60.67	65.37	74.97
6	**Total ash**	6.43	5.20	3.60

Table 2. Effect of Garlic powder on heamto-biochemical profile of broilers

Treatments	Haemoglobin (mg/dl)	Glucose (mg/dl)	Cholesterol (mg/dl)	HDLC (mg/dl)	LDLC (mg/dl)	VLDLC (mg/dl)	Triglycerides (mg/dl)	Protein (mg/dl)
T_0	8.25^{e}	213.34^{e}	175.94^{a}	61.67^{e}	94.21^{e}	20.05^{e}	100.28^{e}	2.86^{e}
T_1	9.90^{c}	238.70^{c}	173.49^{d}	67.88^{d}	86.30^{d}	19.30^{d}	96.52^{d}	3.08^{c}
T_2	10.65^{b}	270.70^{a}	170.29^{c}	70.34^{c}	81.09^{c}	18.86^{c}	94.33^{c}	3.19^{b}
T_3	11.20^{a}	247.11^{b}	162.26^{b}	76.96^{b}	67.40^{c}	17.89^{b}	89.47^{b}	3.56^{a}
T_4	9.00^{d}	229.92^{d}	153.43^{a}	82.71^{a}	53.98^{a}	16.74^{a}	83.70^{a}	2.94^{d}
SE	0.07	0.86	0.38	0.47	0.67	0.082	0.36	0.018
CD (p>0.05%)	0.15	1.83	0.80	1.01	1.43	0.17	0.74	0.04

(^{a,b,c,d,e} means with different superscripts differed significantly