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Effect of dietary supplementation of garlic (*Allium sativum*) on haemato-biochemical parameters of Kadaknath layer birds in Arid zone

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Abstract
The aim of this study was to determine the effect of supplementation of Garlic (*Allium sativum*) powder in the ration of Kadaknath layers on haematological parameters. A feeding trial of twelve weeks using 150 birds of 39 weeks old Kadaknath layers was conducted and followed metabolic trial of five days. The birds were divided into five treatments having three replicates in each group with 10 birds in each replicate. The treatment T_1 *i.e.* control group fed with unsupplemented diet and T_2, T_3, T_4, T_5 supplemented with 0.5%, 1%, 1.5% and 2% level, of Garlic powder along with basal diet, respectively. The results of present study revealed highly significant ($P<0.01$) effect on serum cholesterol, serum triglycerides whereas haematological parameters *i.e.* Hb, PCV, DLC, TLC and TEC found to be non-significant among various treatment groups and were in normal range in present study. Similarly, the serum enzymes (serum AST, serum ALT, serum ALP) and serum glucose were also in normal range and found non-significant among various treatment groups.

Keywords: Haematological parameters, erythrogram, Leucogram, garlic, Kadaknath layers

Introduction
The Kadaknath is one of the important native chicken breed in India. Kadaknath breed known as Kalamashi for its black-colored meat. Kadaknath is being reared by tribal communities in its breeding tract of the Jhabua and Dhar districts in the western region of the state of Madhya Pradesh and in adjoining areas of the states of Gujarat and Rajasthan. Various studies indicated that the Kadaknath chicken eggs have good nutritive value and used to treat headaches, post-delivery problems, asthma and nephritis. Eggs contain vitamins, protein, fat, calcium, phosphorus, iron, nicotinic acid and many amino acids. Use of herbal feed additive is gaining importance in poultry production due to ban on use of antibiotics due to harmful residual effects and cost effectiveness. Probiotics, prebiotics, enzymes, organic acids, minerals as well as herbs can be seen as alternatives to antibiotic feed additives. Garlic has several anti-parasitic, anti-viral, anti-bacterial and anti-fungal properties (Puvaca *et al*., 2014) [10] and has been used traditionally for treating respiratory infections, ulcers, diarrhoea and skin infections (Fenwick and Hanley, 1985) [6]. Dietary supplementation of Garlic (*Allium sativum*) was reported to enhance laying performance and reduction in egg yolk cholesterol in laying hens (Khan *et al*., 2007; Toghyani *et al*., 2011) [7, 12].

Materials and Methods
A total of 150 Kadaknath layers of 39 weeks age were used in the present experiment and birds were reared on deep litter at college poultry farm for 12 weeks. The experimental layers were selected on body weight basis. The layers were assigned randomly to various experimental groups. The birds were divided into five treatments having three replicates in each group with 10 birds in each replicate. The treatment T_1 *i.e.* control group fed with unsupplemented diet and T_2, T_3, T_4, T_5 supplemented with 0.5%, 1%, 1.5% and 2% level, of Garlic powder along with basal diet, respectively. After completion of feeding trial at last day of trial, two birds from each replication were randomly picked up for blood sample collection and blood was collected from wing vein with all aseptic precautions. Various haemato-biochemical parameters were investigated at the end of experiment to judge the physiological status of health of Kadaknath layers.

All the parameters of blood were estimated in TVCC laboratory, College of Veterinary and Animal Science, Bikaner. Haemoglobin and PCV were determined by Sahli-Hellige haemoglobinometer and microhaematocrit method, respectively.

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Differential leucocyte count (DLC) was carried out as per the standard method described by Jain (1986) and expressed as per cent. Total erythrocyte count (TEC) and total leukocytes count (TLC) was carried out manually through haemocyometer as per standard method of Benjamin (1978) [4].

For sero-bio-chemical studies, blood was collected in another sterile tubes having no anticoagulant and kept in slant position in incubator at 37^0C for one hour. Blood clots were broken and tubes were centrifuged at 2500 rpm for 30 minutes. Serum was separated for analysis of serum cholesterol, serum triglycerides, serum aspartate aminotransferase (AST), serum alanine aminotransferase (ALT), serum alkaline phosphatase (ALP), serum glucose. All sero-biochemical parameters were determined by the Thermoscientific Evolution 220 UV-Visible spectrophotometer. Serum cholesterol, serum aspartate aminotransferase (AST), serum alanine aminotransferase (ALT), serum alkaline phosphatase (ALP) and serum glucose were determined by using kit supplied by coral clinical system and serum triglycerides was determined using kit supplied by Diasys dignostics India pvt. Ltd. as per the manufacturer's subscribed procedure.

Statistical analysis
Data collected during the present investigation were subjected to statistical analysis by adopting appropriate methods of analysis of variance as described by Snedecor and Cochran (2004) [11]. Wherever, the variance ratio (F-values) were found significant at 5 per cent and 1 per cent levels of probability, the significance of mean differences was tested by Duncan's New Multiple Range Test (Duncan's Range Test) as modified by Kramer (Kramer 1956) [8].

Results and Discussion
To determine the effect of supplementation of Garlic *(Allium sativum)* powder at different levels as feed additive in the ration of Kadaknath layers on physiological status, haemato-biochemical parameters were studied in different treatment groups. The parameters recorded were hemoglobin, packed cell volume, DLC, TLC, TEC, serum cholesterol, serum triglycerides, serum ALP, serum ALT, serum glucose and serum AST.

Haemoglobin and erythrogram
The data of haemoglobin and erthrogram recorded in various treatment groups have been presented in Table 1. Hemoglobin, PCV and TEC were observed non-significant among all treatment groups and vary within normal range. The result of hemoglobin and packed cell volume in present study corroborates well with findings of Ademola *et al.* (2009) [1] who reported non-significant effect due to supplementation of Garlic *(Allium sativum)* powder as feed

additive in the diet of Kadaknath layers. The result of TEC in present study corroborates well with findings of Aswal *et al.* (2017) [3] who recorded non-significant effect on TEC due to supplementation of Garlic *(Allium sativum)* powder as feed additive in the diet of White leghorn layer.

Leucogram
The data of leucogram recorded in various treatment groups have been presented in Table 1. Total leucocyte count and DLC were found to be non-significant among all treatment groups and vary within normal range. The result of TLC in present study corroborates well with findings of Aswal *et al.* (2017) [3] who recorded non-significant effect on TLC due to supplementation of Garlic *(Allium sativum)* powder as feed additive in the diet of White leghorn layer.

Serum lipid profile and Serum glucose
The data of serum lipid profile and serum glucose recorded in various treatment groups have been presented in Table 1. The statistical analysis of data revealed highly significant ($P<0.01$) effect on serum cholesterol due to supplementation of Garlic *(Allium sativum)* powder at different levels as feed additive in the ration of Kadaknath layers. The result of serum cholesterol in present study corroborates well with findings of Lim *et al.* (2006), Canogullari *et al.* (2010), Aswal *et al.* (2017) [9, 5, 3] who recorded significant reduction in cholesterol level due to supplementation of Garlic *(Allium sativum)* powder as feed additive in the diet of White leghorn layer, Japanese quails and White leghorn layer, respectively.
The statistical analysis of data has been revealed highly significant ($P<0.01$) effect on serum triglycerides due to supplementation of Garlic *(Allium sativum)* powder at different levels as feed additive in the ration of Kadaknath layers. The result of serum triglycerides in present study corroborates well with findings of Aswal *et al.* (2017) [3] who recorded significant ($P<0.05$) reduction in serum triglycerides due to supplementation of Garlic *(Allium sativum)* powder as feed additive in the diet of White leghorn layer. The reduction in serum triglycerides level by supplementation of Garlic powder may be due to inhibition of fatty acid synthetase enzyme by Garlic (Adler and Holub, 1997) [2]. Serum glucose was found to be non-significant among all treatment groups and vary within normal range.

Serum enzyme profile
The data of serum asparatase transminase (AST), serum alanine transminase (ALT) and serum alkaline phosphatase enzyme (ALP) observed in various treatment groups have been presented in Table 1.
Serum AST (IU/L), Serum ALT (IU/L) and Serum ALP (IU/L) was found to be non-significant among all treatment groups and vary within normal range.

Table 1: Hemato biochemical parameters of Kadaknath layers in different dietary treatments

	T_1	T_2	T_3	T_4	T_5	SEM
Hb %	16.04	16.33	16.50	16.04	16.57	0.324
PCV %	40.10	40.82	41.24	40.09	41.42	0.810
TEC (10^6/ml)	2.70	2.69	2.71	2.70	2.71	0.025
TLC (10^3/ml)	29.44	29.54	29.57	29.40	29.60	0.097
Lymphocytes %	65.95	66.90	67.23	66.85	66.20	0.774
Monocytes %	3.20	2.86	3.19	3.35	3.09	0.0218
Eosinophils %	3.12	3.17	3.15	3.18	3.11	0.171
Basophils %	2.06	2.05	2.05	2.04	2.05	0.013
Heterophils %	24.58	25.42	24.93	25.31	25.09	0.697
Serum cholesterol (mg/dl)	100.48[b]	94.10[ab]	91.51[ab]	91.39[ab]	87.40[a]	2.21

Serum triglycerides (mg/dl)	246.55[b]	235.37[ab]	234.58[ab]	230.70[a]	225.35[a]	3.317
Serum glucose (mg/dl)	184.54	195.50	191.16	190.42	192.01	5.285
Serum ALP (IU/L)	211.80	217.35	207.43	210.32	215.18	1.755
Serum ALT (IU/L)	5.75	5.63	5.79	5.62	6.02	0.414
Serum AST (IU/L)	116.67	126.21	120.89	121.50	123.30	3.485

a, b - Means superscripted with different letters within a row differ significantly from each other.

Conclusion

These results of present investigation of supplementation of Garlic powder in Kadaknath layers indicated the potential beneficial effects of Garlic by reducing the serum cholesterol and serum triglycerides in Kadaknath layers. However, the effects were highly significant ($P<0.01$) on serum cholesterol and serum triglycerides but the present observations will provide the basis for future studies with clinical trials on mass level.

Acknowledgement

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