



Effect of Supplementing *Moringa oleifera* and Organic Acid on the Haemato-Biochemical Parameters of Broilers

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ABSTRACT

The present study was conducted to investigate the effect of supplementing *Moringa oleifera* and organic acid on the haemato-biochemical performance of broilers. Two hundred and twenty-five, day-old unsexed broiler chicks were used on a completely randomized design in four groups with three replicates, each consisting of 15 broiler chicks. The treatments included the T0 group (negative control i.e. basal ration without antibiotic), T1 group (control i.e. basal ration with antibiotics), T2 group (basal Ration + 1% *M. oleifera*), T3 group (basal Ration + 0.5 % Organic acid) and T4 group (basal Ration + 1% *M. oleifera* + 0.5% Organic acid). The haemato-biochemical parameters were studied after the end of the trial. The results of the present study showed that supplementation of *M. oleifera*, Organic acid alone and in combination did not affect the hematological indices viz. Hb, PCV, TLC, DLC in broiler chickens. The cholesterol, triglycerides, HDL and LDL content of chicken broilers were significantly improved in group supplemented with combination of *M. oleifera* and Organic acid (T4). Therefore, it can be concluded that 1% *M. oleifera* alone, 0.5% Organic acid alone or combination of both can be effectively supplemented to improve serum biochemical parameters of broiler chicken ration without any adverse effect on survivability of birds.

KEYWORDS: Broilers, Cholesterol, Haemato-biochemical, *M. oleifera*, Organic acid

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INTRODUCTION

In poultry, the broilers play an important role in augmenting the economic and nutritional status of varied populations. Antibiotics are used in the poultry business to promote meat production, these substances have contributed to an increase in the problem of antibiotic resistance. There are a large number of non-therapeutic alternatives that can substitute antibiotics. One such alternative is *M. oleifera*, a well-known cultivated species in the genus *Moringa*, (family Moringaceae) under the order Brassicales. *M.oleifera* leaves have antimicrobial roles and are rich in fats, proteins, vitamins, and minerals (Onunkwo et al., 2015; Abbas et al., 2013). *M. oleifera* leaf extracts are reported to possess a hypocholesterolemic function (Ghasi et al., 2000). β -sitosterol and 4-[α -(L-rhamnosyloxy) benzyl]-o-methyl thiocarbamate (trans) are two important active substances present in the leaf

extracts of *M. oleifera* that exhibit cholesterol-lowering activities. Organic acids and their salts are generally regarded as safe (GRAS) and have been approved by most member states of the EU to be used as feed additives in animal production. Organic acids can enter the bacteria cell wall and disrupt the normal physiology of some types of bacteria view of this, efforts were made to study the effect of *M. oleifera* and citric acid supplementation on certain haemato-biochemical parameters of broilers.

MATERIALS AND METHODS

The study was carried out in the poultry shed of the Department of Livestock Production Management, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Sciences (LUVAS), Hisar. 225 Day-old unsexed broiler chicks were used on a completely randomized design in four groups with three replicates, each

consisting of 15 broiler chicks. The treatments included the T0 group (negative control i.e. basal ration without antibiotic), T1 group (control i.e. basal ration with antibiotics), T2 group (basal Ration + 1% *M. oleifera*), T3 group (basal Ration + 0.5 % Organic acid) and T4 group (basal Ration + 1% *M. oleifera* + 0.5% Organic acid). Diets of each treatment group was formulated for three growth

periods i.e., pre-starter, starter and finisher. Maize, groundnut cake and soybean meal based diet was computed as per BIS (2007) to meet out the metabolizable energy (ME), crude protein and essential amino acids (lysine, methionine) requirements of birds. The proximate composition of the pre-starter, starter and finisher rations is as given in Table 1.

Table 1. Quantity of ingredients and chemical composition (% DM basis) of experimental diets (kg/100 kg feed)

Ingredients	Quantity		
	Pre-starter (0-1 weeks)	Starter (2-3 weeks)	Finisher (4-6 weeks)
Maize	54	55.2	58
Soybean meal	20	19	10
Ground nut cake	14.5	13	17
Fish meal	7	7	7
Mineral mixture	2	2	2
Vegetable oil	2.5	4	6
Chemical composition	Pre-starter	Starter	Finisher
CP %	22.92	22.32	20.28
EE %	6.30	7.10	9.30
CF %	3.69	3.33	3.20
TA %	4.76	4.40	3.58
NFE	62.46	63.85	63.80
ME (Kcal/Kg)*	3000	3110	3215

*Calculated (BIS 2007)

The experimental chicks were reared under strict hygienic conditions. Birds were vaccinated against F1 strain of Ranikhet / Newcastle disease (NCD) on 0 day and Infectious Bursal Disease (IBD) disease on 14th day through intranasal route. Standard managerial practices including brooding, proper lighting, raking of litter, cleaning of feeders, waterers, etc. were followed throughout the experiment. Data obtained were subjected to statistical analysis as per Snedecor and Cochran (1994) using Completely Randomized Design (CRD). All the data were subjected to one way ANOVA using the SPSS software (version-23).

RESULTS AND DISCUSSION

The effect of *M. oleifera* and Organic acid on mean hematological parameters of chicken broilers is presented in Table 2. The value of mean

haematological parameters under different treatment groups were found to be statistically similar. The mean values of Hb, PCV, TEC, TLC, Lymphocyte, Heterophil, Monocyte, Eosinophil and Basophil ranged from 9.31(T0) to 9.32(T1), 28.83(T2) to 28.91(T4), 2.23(T2) to 2.33(T4), 21.1(T4), to 21.5(T3), 66.3(T4), to 66.4(T0), 29.2(T3), to 29.28(T1), 1.32(T0) to 1.33(T4), 0.30(T2) to 0.31(T4), 1.30(T3), to 1.31(T4), respectively. The results of present study showed that supplementation of *M. oleifera*, Organic acid alone and in combination did not affect the hematological indices viz. Hb, PCV, TLC, DLC in broiler chickens. Further, the values of hematological parameters are found in their normal ranges indicated that dietary supplementation of *M. oleifera* and Organic acid has no harmful effects on the internal physiology of broilers.

Table 2. Effect of *M. oleifera* and organic acid on mean haematological parameters of broiler chicken at 42 day

Parameter	Unit	TREATMENTS				
		T0	T1	T2	T3	T4
Hb	g/dl	9.31 ±.01	9.32 ±.05	9.30 ±.06	9.31±.01	9.32 ±.01
PCV	%	28.8 ±.04	28.9±.17	28.8±.19	28.8±.03	28.9±.05
TEC	millions/mm ³	2.31±.04	2.30±.04	2.23±.06	2.30±.05	2.33±.02
TLC	Thousand/mm ³	21.1±.18	21.2±.28	21.1±.30	21.5±.14	21.1±.29
LYMPHOCYTE	%	66.4±.15	66.3±.04	66.39±.04	66.3±.06	66.3±.01
HETEROPHIL	%	29.2±.007	29.2±.013	29.2±.003	29.2±.007	29.2±.005
MONOCYTE	%	1.32±.003	1.32±.005	1.32±.005	1.32±.004	1.33±.001
EOSINOPHIL	%	0.30±.004	0.31±.006	0.30±.002	0.31±.003	0.31±.004
BASOPHIL	%	1.30±.005	1.30±.006	1.30±.004	1.30±.004	1.31±.003

Means bearing different superscripts, differ significantly ($P<0.05$) row wise.

Present results were in accordance with Aiyedun et al. (2020), Hafsa et al. (2020) and Vazquez et al. (2020) who observed no significant effect of Moringa leaf meal on Hb, PCV, RBC, MCV and MCH values of supplemented birds. Abbas et al. (2018) reported no effect of MOLM on PCV and WBC values among the different groups. The findings of this study had shown non-significant effect of Organic acid supplementation in broilers which is in agreement with Solanki et al. (2020) who studied the effect of supplementation of neem leaf meal (NLM) and citric acid (CA) on hemato-biochemical parameters in broilers in different treatments and concluded that the haematological parameters (Hb, PCV and TLC etc) did not influence significantly by feeding of NLM and CA in broiler birds. However, contradictory findings were observed by Al-Saad et al. (2014) who reported significant increase in number of WBC in birds of organic acids group than control one.

The effect of *M. oleifera* and Organic acid on mean serum biochemical parameters of chicken broilers is presented in Table 3. Dietary

supplementation with *M. oleifera* and Organic acid has significant ($P<0.05$) effect on cholesterol, triglycerides, HDL and LDL content in serum of broiler chicken. The cholesterol, triglycerides, HDL and LDL content ranged from 171.0 (T0) to 156.2 (T4) and 156.9 (T2), 37.0 (T0) to 30.9(T4) and 31.7 (T2), 120.0 (T0) to 124.9 (T4) and 37.2 (T0) to 34.9 (T4), respectively. T4 and T2 treatment attained significantly lower ($P<0.05$) levels of cholesterol and triglycerides than other treatment group. Also, T3 and T1 were comparable with each other. Also, T4 recorded significantly higher ($P<0.05$) HDL content followed by T2 in comparison with T1, T3 and T0 treatments. Also, T3 and T1 were comparable with each other but recorded significantly higher ($P<0.05$) value than the T0 group. T4 recorded significantly lower ($P<0.05$) LDL content than all other treatments. Also, T1 and T2 were comparable with each other. T3 group which was supplemented with 0.5% organic acid recorded significantly higher ($P<0.05$) value of LDL than T1, T2 and T4 treatment groups.

Table 3. Effect of *M. oleifera* and organic acid on mean serum biochemical parameters of broiler chicken at 42 day

Parameter	TREATMENTS				
	T0	T1	T2	T3	T4
Cholesterol (mg/dl)	171.03 ^c ±0.40	169.57 ^b ±0.14	156.97 ^a ±0.29	169.35 ^b ±0.16	156.24 ^a ±0.30
Triglycerides (mg/dl)	37.0 ^c ±0.37	35.4 ^b ±0.45	31.7 ^a ±0.19	36.04 ^b ±0.20	30.9 ^a ±0.32
HDL (mg/dl)	120.09 ^a ±0.18	121.6 ^b ±0.11	122.86 ^c ±0.29	122.12 ^{bc} ±0.22	124.89 ^d ±0.45
LDL (mg/dl)	37.2 ^d ±0.10	35.6 ^b ±0.10	35.5 ^b ±0.18	36.6 ^c ±0.20	34.9 ^a ±0.22

Means bearing different superscripts, differ significantly ($P < 0.05$) row wise.

The reduction in the levels of cholesterol in broilers supplemented with Moringa leaf meal might be due to the synergistic action of the various bioactive compounds of leaves like phenolic compounds and flavonoids which are involved in the inhibition of pancreatic cholesterol esterase activity, thereby reducing and delaying cholesterol absorption and binding bile acids thus reducing plasma cholesterol concentrations (Adisakwattana and Chanathong, 2011). *M. oleifera* (MO) leaves contain the bioactive β -sitosterol, which might responsible for the cholesterol depressing action in blood plasma of Moringa extract supplemented group birds.

The lower cholesterol in Moringa supplemented groups in this study are in agreement with findings of Egu (2019), Ajantha et al. (2020) and Hafsa et al. (2020), who observed significant ($P < 0.05$) decrease in total cholesterol and triglyceride level in Moringa leaf supplemented group birds while Abbas et al. (2018), Djouhou et al. (2020) and Omar et al. (2020) reported significant ($P < 0.05$) decrease in total cholesterol values in blood serum of MOLM supplemented birds. The lower cholesterol in organic acid-supplemented groups in this study are in agreement with findings of Nourmohammadi and Khosravinia (2015) confirmed the depression in the serum cholesterol concentration in Organic acid supplemented broiler chicken. On the contrary to the present findings, Solanki et al. (2020) studied the effect of supplementation of neem leaf meal (NLM) and citric acid (CA) on hemato biochemical

parameters in broilers in different treatments and concluded that the serum biochemical parameters like cholesterol did not influence significantly by feeding of NLM and CA in broiler birds.

CONCLUSION

From the study, it can be concluded that the group supplemented with 1% *M. oleifera* + 0.5% Organic acid had improved triglycerides, HDL and LDL content of chicken broilers. The cholesterol level was significantly reduced in group supplemented with 1% *M. oleifera* + 0.5% Organic acid. However, supplementation of *M. oleifera*, Organic acid alone and in combination did not affect the hematological indices viz. Hb, PCV, TLC, DLC in broiler chickens.

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