



## EFFECT OF SUPPLEMENTATION DIET WITH GARLIC POWDER (*ALLIUM SATIVUM*) AND ORGANIC ACID ON SOME HEMATOLOGICAL AND BIOCHEMICAL TRAITS IN BROILER

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### Abstract

This study contained 160 Ross 308 broiler chicks. They were divided into four groups and two replicated for each group. The 1st group (control group) the chicks were fed on a basic diet where added 2 g garlic powder / kg to the diet for the 2nd group, 1g of organic acid powder / kg to the diet for the 3rd group while added(2 g garlic and 1g organic acid / kg) to the diet for the 4th group. The results of the statistical analysis showed significant ( $P \leq 0.05$ ) decrease in RBC and PCV in third and fourth group, While WBC and HB did not record any significant in treated groups and significant ( $P \leq 0.05$ ) decrease of H/L ratio in second and third groups. Decrease in the cholesterol, triglycerides and albumin concentration in treated groups and increase in total protein and globulin in treated groups.

**Keywords :** Garlic powder, organic acid, Broiler Chicks.

### Introduction

Researchers started using alternate methods to improve performance of broiler chickens, include adding medicinal herbs, dietary yeasts and organic acids due to their obvious impact on the economic, physiological and health characteristics of poultry (Khosravi *et al.*, 2010). Garlic (*Allium sativum*) belongs to the Amaryllidaceae family and is a winter vegetable (Parle & Kumar, 2007). (Martins *et al.*, 2016) found garlic rich in vitamins and minerals many vitamins, including (vitamin A, B1, B2, B6, B3) and range of minerals such as phosphorus, germanium, calcium, copper, iron, potassium, magnesium, zinc, selenium and organic selenium compounds (Ayaz, 2008). Garlic contains allicin compounds and fat-soluble sulfur compounds such as Diallyl-disulfide and water-soluble sulfur compounds, as well as, procaclandin, fructan, vitamin C, E, biotin, Thiosulfinate and fatty acids Phospholipid (Corzo-Martínez *et al.*, 2007). Bravo, (2003) noted its importance and nutritional value as it contains protein, carbohydrates, static and volatile oils, phenolic compounds and fibers. It work to reduce the blood pressure, lower high cholesterol, prevent heart attacks, cancer and inhibit microbe growth (Gebreyohannes & Gebreyohannes, 2013). Garlic is used both as condiment and medicament, anticoagulant, antioxidant, hypolipidaemic, antihypertensive, antiageing, antiplatelet and heavy metal detoxifier (Marilynn, 2001). The garlic cause increase in the number of lymphocyte in the broiler chicks supplied with garlic extract which could be the cause of decreased H/L ratio (El-katcha *et al.*, 2016).

In addition, 3% garlic powder can reduced the level of cholesterol and triglycerides in the serum of broilers thus help in improving the lipid profile of broiler (Ratika *et al.*, 2018). Inclusion garlic supplementation in 0.75% mixed diet improves the biochemical indices in broilers lead to significant increase of globulin and albumin levels (Kansal *et al.*, 2017). Ulsagheer *et al.* (2019) indicate there was significant increase in the level of protein in the blood if garlic supplementation to the diet. (Ajeel& Al-Faragi, 2013) recommend to dietary supplements of garlic it cause

increased total plasma protein, albumin and globulin concentrations in fish.

Organic acids can be both bacteriostatic and bactericidal and these actions depend on the levels of their inclusion. These acids can be effectively used along with other feed additives (Lückstädt& Mellor, 2011). and lowering mortality (Al-Kaissy, 2006).The supplemented organic acids recorded significantly lower blood Hb and RBC count and decreased the H: L ratio when supplementation with1 g/kg organic acids (Salah *et al.*, 2019). (Gilani *et al.*, 2018) revealed organic acids reduced the cholesterol; total blood lipids profile and increased HDL level of the chicks at 21 and 42 days of age. Organic acids have enhanced protein and digestible energy by reducing microbial competition with nutrient host, self-nitrogen loss, ammonia production, and other microbes that inhibit metabolism (Islam *et al.*, 2008). This study carried out to explain the effect of adding garlic powder, organic acid and their combination to the broiler diet in some Hematological and Biochemical traits in broiler.

### Materials and Methods

This study was conceded in the Poultry Farm, Ministry Of Agriculture AL- Iraqia Company for Production and marketing of agricultural products- Poultry project AL-Suwra/2 in Wasit Governorate from 29/11/2019 to 2/1/2020. A total of 160 chicks of one- day- old from Ross-308 broiler chicks were purchased from local hatchery. They were reared under optimal conditions from first until fifth weeks of age. Chicks were fed a starter and finisher diet (corn, wheat, and soya diet), (table 1). The chicks at the first day were weighed and divided equally into four groups of 40 birds with 2 replicates in each group. All birds in this study were offered feed and water *ad libitum*. The first group (control): chicks were fed basal diet without any supplement. The second group: were fed on basal diet with adding Garlic powder 2g. The third group was fed on basal diet with adding 1g Organic acids. The fourth group was fed on basal diet with adding Garlic powder 2g and 1g Organic acids.

Chicks (groups) were raised in (1.5m× 2m) floor pens with one feeder and one fount drinker. On arrival, chicks were randomly distributed into wood shavings covered floor

pen, and then they were given drinking water with Tyrosine tartrate and Enrofloxacin for three day.

**Table 1 :** Composition of the Experimental Diets

Ingredients (%)	Starter (1-21) day of age	Finisher (21-35) day of age
Yellow corn	36.86	39.93
Soybean meal	28	25
Wheat	24	24
Protein concentrate	5	5
Lime stone	0.9	0.6
Dicalcium phosphate	1.0	0.9
Salt ( NaCl )	0.1	0.1
Methionine (%)	0.19	0.07
Lysine (%)	0.05	-
Sunflower Oil	3.9	4.4
Total	100	100
<b>Calculated chemical analysis</b>		
Metabolizable energy (kcal/kg)	2953	3123
Crude protein (%)	24.5	20.77
Methionine + Cytine	1.07	0.85
Lysine	1.43	1.13
Phosphors	0.45	0.45
Calcium	1.08	0.85

The diets were formulated to complete requirement by the National Research Council (NRC, 1994). Animal protein concentrate contain (CP) 40% , (ME) 2100 kcal/kg , Lysine 3.85 , + Cysteine 4%, Calcium 6.5, Phosphors 2.6

## Results

### WBC, RBC, Hb and PCV

As shown in table (2) there were non-significant differences between groups in WBC and Hb value. While the

RBC and PCV in group four and three it's recorded minimal values ( $1.72 \times 10^3 / \text{ml} \pm 0.04$ ,  $1.79 \times 10^3 / \text{ml} \pm 0.07$ ) respectively as compared to groups (1 and 2); group four and three recorded minimal values ( $24.20 \% \pm 0.58$ ,  $25.36 \% \pm 1.11$ ) % respectively as compared with second and first groups ( $28.87 \% \pm 0.86$ ,  $29.41 \% \pm 0.36$ ) % respectively in PCV values .

**Table 2 :** Effect of garlic, organic acids and there combination on WBC and RBC in broiler chicks (Mean  $\pm$  SE) n=6

Groups Parameter	G 1	G2	G3	G4
WBC ( $\times 10^3 / \text{ml}$ ),	85.11 $\pm$ 0.81 a	85.15 $\pm$ 0.85 a	85.33 $\pm$ 1.09 a	82.78 $\pm$ 0.65 a
LSD value 2.571 NS				
RBC ( $\times 10^6 / \text{ml}$ ),	2.01 $\pm$ 0.02 a	1.97 $\pm$ 0.06 a	1.79 $\pm$ 0.07 b	1.72 $\pm$ 0.04 b
LSD value 0.163 *				
Hb(g/dl)	10.26 $\pm$ 0.13 a	10.18 $\pm$ 0.19 a	9.86 $\pm$ 0.30 a	10.30 $\pm$ 0.18 a
LSD value 0.631 NS				
PCV%	29.41 $\pm$ 0.36 a	28.87 $\pm$ 0.86 a	25.36 $\pm$ 1.11 b	24.20 $\pm$ 0.58 b
LSD value 2.301 *				

Means with a different letter in the same column significantly different ( $P < 0.05$ ) \* ( $P < 0.05$ ), NS: Non-Significant  
G1 (Control), G2 (2g/ kg diet garlic), G3 (1g/kg diet organic acids) and G4 (2g/kg diet garlic and 1g/kg diet organic acids)

### Heterophil to lymphocyte (H/ L)

The results in table (3) showed significant ( $P \leq 0.05$ ) decrease in Heterophil in groups 3 and 2 the recorded lowest values ( $9.23 \pm 0.92$ ,  $9.60 \pm 1.00$ ) respectively. But there were significant ( $P \leq 0.05$ ) decrease in control and fourth groups ( $54.66 \pm 1.66$ ,  $55.45 \pm 1.56$ ) as compared to the second and

third groups ( $57.76 \pm 1.34$ ,  $59.06 \pm 1.51$ ) respectively in values of lymphocyte. The result of Heterophil / lymphocyte values were significant ( $P \leq 0.05$ ) decrease in third and second groups ( $0.16 \pm 0.02$ ,  $0.17 \pm 0.02$ ) compared to the control and fourth group ( $0.22 \pm 0.02$ ,  $0.21 \pm 0.03$ ) respectively.

**Table 3 :** Effect of garlic, organic acids and there combination on heterophil, lymphocyte and Heterophil/ lymphocyte ratio in broiler chicks (Mean  $\pm$  SE), n=6.

Groups Parameter	G1	G2	G3	G4
H	11.67 $\pm$ 0.99 A	9.60 $\pm$ 1.00 b	9.23 $\pm$ 0.92 b	11.30 $\pm$ 0.63 a
LSD	1.22			
L	54.66 $\pm$ 1.66 B	57.76 $\pm$ 1.34 a	59.06 $\pm$ 1.51 a	55.45 $\pm$ 1.56 b
LSD	2.01			
H/L ratio	0.22 $\pm$ 0.02 A	0.17 $\pm$ 0.02 b	0.16 $\pm$ 0.02 b	0.21 $\pm$ 0.03 a
LSD	0.03			

Means with a different letter in the same column significantly different (P<0.05) \* (P<0.05), NS: Non-Significant  
G1 (Control), G2 (2g/ kg diet garlic), G3 (1g/kg diet organic acids) and G4 (2g/kg diet garlic and 1g/kg diet organic acids)

#### Concentrations of Total Protein (g/L), Albumin, Globulin

The results in table (4) showed total protein significant (P $\leq$ 0.05) increase in fourth, third and second groups (4.85  $\pm$ 0.10, 4.80  $\pm$ 0.12, 4.55  $\pm$ 0.33) respectively as compared with the control (4.30  $\pm$ 0.18) while there were non-significant differences between first and second groups. Albumin values

showed significant (P $\leq$ 0.05) decrease in the 4, 3, 2 groups (2.04  $\pm$ 0.04, 2.00  $\pm$ 0.04, 1.93  $\pm$ 0.030) g/L respectively as compared with the control. Globulin values showed significant increment in fourth, third and second groups (2.92  $\pm$ 0.09, 2.80  $\pm$ 0.11, and 2.51  $\pm$ 0.20) g/L respectively compared to the control group.

**Table 4 :** Effect of garlic, organic acids and there combination on total protein, Albumin and Globulin in Serum for different groups in broiler chicks (Mean  $\pm$  SE), n=6.

Group Parameter	G1	G2	G3	G4
Protein (g/L)	4.30 $\pm$ 0.18 B	4.55 $\pm$ 0.33 ab	4.80 $\pm$ 0.12 a	4.85 $\pm$ 0.10 a
LSD value 0.486				
Albumin (g/L)	2.42 $\pm$ 0.06 A	2.04 $\pm$ 0.04 b	2.00 $\pm$ 0.04 b	1.93 $\pm$ 0.03 b
LSD value 0.231				
Globulin (g/L)	1.88 $\pm$ 0.19 B	2.51 $\pm$ 0.20 a	2.80 $\pm$ 0.11 a	2.92 $\pm$ 0.09 a
LSD value 0.447				

Means with a different letter in the same column significantly different (P<0.05) \* (P<0.05), NS: Non-Significant  
G1 (Control), G2 (2g/ kg diet garlic), G3 (1g/kg diet organic acids) and G4 (2g/kg diet garlic and 1g/kg diet organic acids)

#### Concentrations of Total Cholesterol (mg/dL) and Triglyceride (mg/dL)

As shown in table (5) the cholesterol in groups 4 and 3 significant (P $\leq$ 0.05) decrease (80.00  $\pm$ 7.50, 86.67  $\pm$ 6.42) mg/dL respectively as compared to control,

**Table 5 :** Effect of garlic, organic acids and there combination on Total Cholesterol and Triglyceride Concentrations (mg/dL) in serum for different groups in broiler chicks (Mean  $\pm$  SE), n=6.

Groups Parameter	G1	G2	G3	G4
Cholesterol (mg/dL)	97.50 $\pm$ 4.44 A	97.50 $\pm$ 5.56 a	86.67 $\pm$ 6.42 b	80.00 $\pm$ 7.50 b
LSD value(7.965) NS				
Triglyceride (mg/dL)	40.00 $\pm$ 2.41 A	32.50 $\pm$ 4.61 b	33.00 $\pm$ 3.32 b	30.67 $\pm$ 3.28 b
LSD value(5.405) NS				

Means with a different letter in the same column significantly different (P<0.05) \* (P<0.05), NS: Non-Significant  
G1 (Control), G2 (2g/ kg diet garlic), G3 (1g/kg diet organic acids) and G4 (2g/kg diet garlic and 1g/kg diet organic acids)

The results of this study recorded significant (P<0.05) decrease in triglyceride concentration in the groups 4, 2, 3 (30.67  $\pm$ 3.28, 32.50  $\pm$ 4.61, 33.00  $\pm$ 3.32) mg/dL respectively at 35 day of age, as compared with control group (40.00  $\pm$ 2.41) mg/dL.

#### Discussion

The results of hematological parameter in this study agree with Ahmed, (2012) who observed that hemoglobin estimation at 2% of garlic did not show significant difference. And agree with Onyimonyi *et al.* (2012) reported that incorporation dried garlic into the ration of broilers at

level 0.25, 0.50 and 0.75 of garlic did not affect the normal hematological integrity of the birds. The results of the present study obtained significant decreased in (RBC) and (PCV %), this finding was disagree with Oleforuh-Okoleh *et al.* (2015) observed significant increase in PCV, HB, WBC, RBC and platelets of garlic treated birds. This rustle to may be due to the properties of garlic compound allicin improve physiological trait in addition garlic may be attributed to role of allicin as antioxidants. (Salah *et al.*, 2018) found the OA-supplemented group recorded significantly lower blood RBC count and decreased the H: L ratio. Decreased heterophil to lymphocytes ratios in broilers feed with organic acids it recorded by (Kim and Kang, 2016). (Towfeq *et al.*, 2018) report supplemented 2.5 mg acetic acid / kg and 2.5 mg lactic acid / kg to feed, the blood parameters were significantly higher for RBC, PCV, HB.

The results of the current study obtained significant increases in total protein globulin concentration while there were significant decreases of albumin in treated groups. This agreement to finding of Al-Massad *et al.* (2018) found significant decreases blood serum albumin concentration and significant increase in the globulin of garlic treated birds. Garlic S-allyl cysteine sulfoxide which is found in allicin which reduced the blood albumin compared with standard. The obtained result were disagreement to finding with (Zeryehun *et al.*, 2017) who observed Mean values of total protein was not affected by treatment with 1-3% garlic powder. (Jadhao *et al.*, 2019) as they were reported that diet supplementation with organic acid increases total protein, albumin and globulin level which improve the immune response. This effect of organic acid supplementation on protein metabolism may be related to improvement of intestinal amino-acids absorption in acidic conditions that consequently enhances protein synthesis.

These results of this study agreed with (Al-Massad *et al.*, 2018) where dietary supplementation of garlic powder in broilers diets reduced the serum levels of cholesterol and triglyceride. Hypocholesterolemic effect in garlic exhibit this effect may be due to its possible role in the inhibition of most important enzymes in cholesterol and lipid synthesis such as cholesterol 7 $\alpha$ -hydroxylase, fatty acid syntheses and hepatic 3-hydroxy-3 methylglutaryl coenzyme A reductive (Sanjeev *et al.*, 2013). Many researchers demonstrate that using garlic powder in broiler diets with other feed additives results in a reduction in cholesterol concentration (AL-Zuhairy and Hashim, 2015). The currant result is disagreement with (Ulsagheer *et al.*, 2019) observed highest level of cholesterol when added garlic powder 0.3g/kg. The obtained results were similar to the finding by (Ibrahim & Omar, 2019) which indicator that addition of organic acids and garlic broiler diets lead to reduced serum blood cholesterol. Variation in the results might be due to levels of organic acid and form of garlic used, seasons, type of feed and its composition, strain differences etc.

### Conclusion

This study proves that adding of organic acids and with garlic powder impact blood characterizes, lower cholesterol and triglyceride, higher total protein and globulin concentration and decrease H/L ratio in blood lead to enhancement immunity of broiler chicks.

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