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EFFECT OF DIETARY BILE SALTS ADDITION ON SOME BLOOD HEMATOLOGY AND INTESTINAL HISTOLOGY OF BROILER CHICKS

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ABSTRACT: The present study carried out to investigate the effect of bile salts (BS) on some blood hematology and intestinal histological changes of broiler chickens. For this purpose, 120 chicks of Ross 308 one day were randomly distributed to four treatment groups with 5 replicates, each 6 birds/replicate. The first group was fed on basal diet only and served as control. The second, third and fourth groups were fed the basal diet plus 0.5, 1 and 1.5 ml bile salts/kg diet, respectively. The results cleared that the addition of 1.0 ml BS/kg in broiler chicks' diets increased significantly ($P < 0.05$ or $P < 0.01$) blood hemoglobin concentration. Histological status of small intestine significantly ($P < 0.01$) affected by addition (BS) to broiler diet. Whereas, villas length and width significantly ($P < 0.01$) increased in groups treated with different levels of BS than control group. From these results, it can be concluded that bile salts had a positive impacts on hemoglobin concentration, morphology and histological changes of small intestine in broiler chicks.

Key words: Bile salts, broiler, blood hematology, histology.

INTRODUCTION

Growth potential of broiler strains has increased according to continuous genetically improvement. So that, there is serious need to high amount of energy. Fats and oils played an important role in recipes of high energy broiler diets. The low digestibility of fat in young broiler chicks may be due to decrease amount of bile salts or the recycling process of bile salts inactive (Leeson and Summers, 2005). Whereas, bile salts (BS) secretion with low amount in young chicks besides decreasing the activity pancreatic lipase they are considered about the initial shorten factors for lipid digestion during first 3 weeks old (El-Katcha *et al.*, 2019).

Bile acids are consisted of cholesterol and integrated with glycine or taurine during the liver precentral hepatocytes, concentrated and stored in the gallbladder, and secreted into the

duodenum where, playing an important role in improving the digestion of fat thorough bile salts dissolvable fats and due to absorption increasing (Begley *et al.*, 2005; Reshetnyak, 2013). In poultry nutrition, the worth of the several fat origins builds on adipose acids tenor, power contents, digestible coefficient and assimilation. There are many factors affected on fats digestion such as dietary fat sources and level of bile secretion (Preston *et al.*, 2001; Abudabos, 2014). Azman *et al.* (2005) reported that a reduced bile salt concentration or absent reduced lipid digestion. Viscosity acts directly important role in hypothesis reabsorption of bile salts. Alzawqari *et al.* (2011) showed that broiler treated with ox bile had villus tall higher significantly ($p < 0.05$) than other treated group or control. Villus is a single of the generality serious spots of nutritive absorption. Therefore, this study designed to investigate the effect of BS at levels of 0.5, 1.0 and 1.5 ml/kg diet, on some blood hematology and intestine histology traits of broiler chickens.

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MATERIALS AND METHODS

One hundred twenty hatched Ross 308 broiler chicks one day old were randomly divided into four experimental groups 30 chicks each, three replicates, each of 10 chicks/replicate. Chick's had nearly equal average initial body weight of all treated groups. The first group served as a control and fed on basal diet. The second, third and fourth groups were fed on control diet plus bile salts at levels of 0.5, 1.0 and 1.5 ml/kg diet, respectively. The basal diet was used to cover the nutrient demands of broiler chickens during 1-42 days of age according to **NRC (1994)**. All chicks were floor brooded and breed under the same administration and healthy case. Diet and water were supplied *ad-labitum* and day light except an hour was preserved during the whole experimental period

Blood Measurements

Toward the finish of trial period, 3 birds from each group were chosen randomly and slaughtered to obtain blood samples. Blood samples were collected into 10 ml EDTA tubs to investigate the possible effect of treatments on some blood constituents. The bottles were closed with rubber stopper and gently shaken to mix the anticoagulation. Red blood cells count (RBCs) ($\times 10^6/\text{mm}^3$), (Haemoglobin concentration Hb) as (g /dl), packed cell volume (PCV) as (%) (**Stoskopf *et al.*, 1983**).

Histopathology Traits

Tissue specimens of the intestine were collected from duodenum, jejunum and ileum. Thymus and bursa of fabresious were possessed and fixed in 15% polish neutral formalin solution for 48 hours, exsiccated in gradual climbing ethanol (from 70 to 100%), filtered in xylene, and established in paraffin. Five-micron stout paraffin were sliced using a microtome (Leica RM2155, England). The segments were ready and then routinely spotted with hematoxylin and eosin (HE) dyes for histopathology (**Suvarna *et al.*, 2013**). All section photos were photographed with a Light microscope combined microscope digital camera. Intestinal villi length, villi width (10 villi per one individual), crypts depth and mucosal thickness were measured by using Image J 1.45 software (National institutes of Health USA) according to

Seyyedin and Naser (2017). The rise was measured from the rule to the upper of the villus at the access to intestinal crypt. The width of the villus was estimated at half of its length. The crypt spit was characterized as the profundity of the invagination between nearby villi.

Statistical Analysis

Data were statically analyzed by using SAS package program (**SAS, 2004**) according to completely randomized design. Differences among experimental groups were detached by Duncan's multiple range test (**Duncan, 1955**). Statistical significance tested using the following model:

$$Y_{ij} = \mu + T_i + e_{ijk}$$

Where:

Y_{ij} = individual observation, μ = the overall mean, T_i = effect of treatment ($i = 1, 2, 3$ and 4), and e_{ijk} = random error.

RESULTS AND DISCUSSION

Hematological Parameters

Presented results of some blood hematology of broiler chickens as affected by BS supplementation are illustrated in Table 1. Values of blood hemoglobin concentration only increased ($P < 0.05$) in groups fed diet plus BS at different grades than control group. While, RBCs count and PCV (%) were insignificantly affected by BS supplementation.

Histology Status

The result in Table 2 revealed that BS supplementation to broiler diet had a significant ($P < 0.01$) impact on histological status of small intestine. Whereas, villas length and width increased ($P < 0.01$) in broiler chicks received different levels of BS than control group. The same trend was observed with crypt depth and mucosa layer thickness as compared to the control. Results of histological status cleared that normal structure of intestinal lumen, villus tall, width, crypt depth and mucosal surfaces in control group (Figs. 1 and 4). Broiler group treated with 0.5% bile salts cleared that intestine had short villi characterized by adhesion villi (fusion villi) with denuded tip and mildly activated crypts and free lumen as shown in Figs. 2 and 3.

Table 1. Some hematological parameters of broiler chicks as affected by different levels of bile salts

	Bile salt levels (ml/kg)				Sig
	0	0.5	1.0	1.5	
RBCS $\times 10^6 \text{ mm}^3$ ¹	2.87 \pm 0.07	2.90 \pm 0.12	3.14 \pm 0.28	2.83 \pm 0.06	NS
Hb (%) ²	8.40 \pm 0.29 ^b	9.85 \pm 0.89 ^b	10.60 \pm 1.39 ^b	13.75 \pm 0.43 ^a	*
PCV (%) ³	39.23 \pm 0.28	41.71 \pm 1.48	42.50 \pm 3.55	37.66 \pm 0.86	NS

Means within the same row with different common superscripts differ significantly.

*= (P < 0.05)

1= Red blood cells count " 2= Haemoglobin " 3= Packed cell volume "

Table 2. Histological intestine as affected by different levels of bile salts

	Bile salt levels (ml/kg)				Sig
	0	0.5	1.0	1.5	
Villi tall (μm)	572.16 \pm 36.24 ^b	501.67 \pm 32.39 ^b	766.42 \pm 147.11 ^b	1284.94 \pm 114.38 ^a	**
villi width (μm)	130.77 \pm 18.78 ^b	169.26 \pm 20.92 ^b	237.91 \pm 18.50 ^a	189.54 \pm 16.55 ^{ab}	*
Crypt depth (μm)	186.88 \pm 43.52 ^c	383.12 \pm 45.71 ^{bc}	444.95 \pm 19.96 ^b	699.13 \pm 136.47 ^a	**
Micosal. Thick (μm)	96.56 \pm 7.63 ^b	153.78 \pm 19.42 ^b	179.63 \pm 19.30 ^b	360.18 \pm 41.75 ^a	**

Means within the same row with different common superscripts differ significantly.

*= (P < 0.05) and **= (P < 0.01).

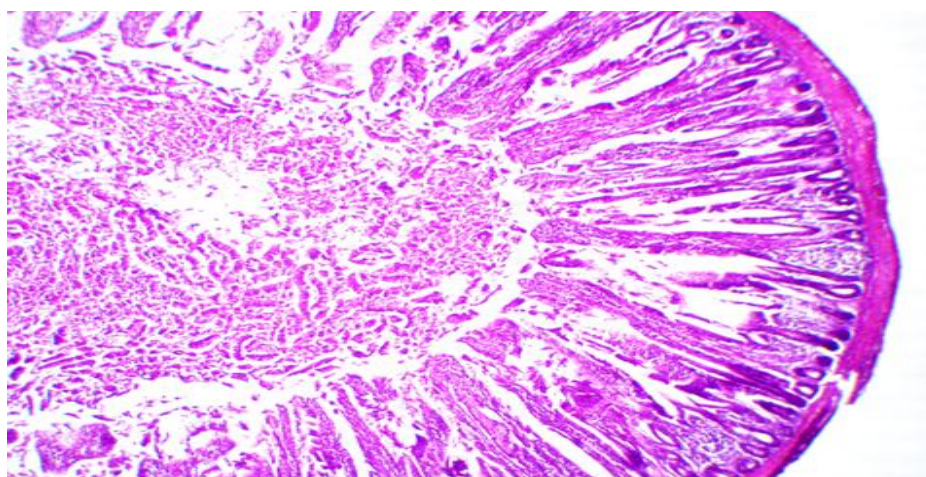


Fig. 1. Photomicrograph of the broiler intestine stained by H and E showing nearly normal height of villi with mild active intestinal crypt. Magnification X40. (Control group)

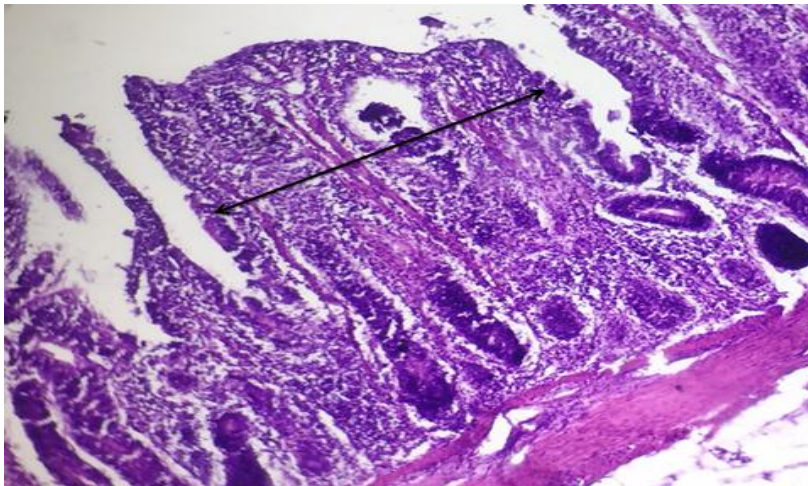


Fig.2. High power of the previous picture to show adhesion (fusion villi) villi (tow head sides) with denuded tip and mildly activated crypts and free lumen. Magnification X 400. group treated with 0.5% BS

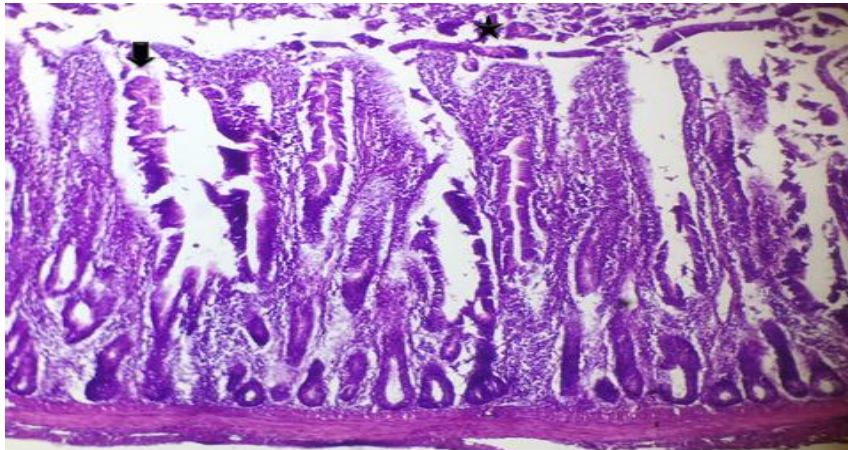


Fig. 3. Photomicrograph of the broiler intestine stained by H and EE (group treated with 1.0% BS) showing luminal debris (desquamated parts) with denuded tips of some villi. Magnification X 200

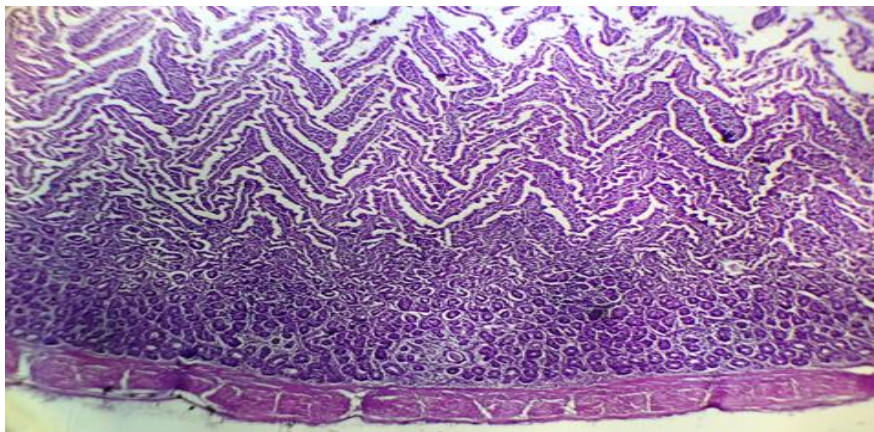


Fig. 4. Photomicrograph of the broiler intestine stained by H and E (group treated with 1.5% BS) showing increase of intestinal crypt layers). Magnification X 200

Our results of histological changes agreed with those obtained by **Alzawqari *et al.* (2011)** who showed that broiler treated with ox bile had villus tall higher significantly ($p < 0.05$) than other treated group or control. Villus is a single of the generality serious spots of nutritive absorption. For long time ago propose that tall and width villi consequence increased flat part and worthy of major absorption of ready ingredients (**Caspary, 1992**). Bestead execution in this trail may be regarding to face villi cause by high grades of BS as confirming by others (**Samanya and Yamauchi, 2002; Maneewan and Yamauchi, 2004**). **Alzawqari *et al.* (2011)** reported that through 22 - 42 days old, Villus hight and submucosa density in the illeum of group fed 0.50% dietary ox bile had higher significantly than other experimental groups or untreated group.

From these results, it can be concluded that bile salts had a positive impact on hemoglobin concentration, morphological and histological changes of small intestine of broiler chicks.

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تأثير إضافة أملاح الصفراء فى العليقة على بعض قياسات الدم الهيماتولوجية والحالة الهستولوجية للالعاء الدقيقة لكتاكت التسمين

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تهدف هذه الدراسة لاكتشاف تأثير اضافة املاح الصفراء على بعض خواص الدم وكذلك على الحالة الهستولوجية للامعاء الدقيقة فى بدارى التسمين، حيث تم تقسيم عدد ١٢٠ ككتوتاً من سلالة الروص ٣٠٨ عمر يوم عشوائيا حيث وزعت إلى أربع مجموعات بكل منها خمس مكررات وكل مكررة تحتوى على ٦ كتاكت حيث تم تغذية المجموعة الاولى على العليقة الاساسية واستخدمت كمجموعة مقارنة وتم تغذية المجموعات الثانية والثالثة والرابعة على العليقة الاساسية مع اضافة مستويات ٠.٥ و ١.٠ و ١.٥ مل من املاح الصفراء/كجم علف على الترتيب، ولقد اوضحت النتائج أن إضافة ١ مل من املاح الصفراء/كجم علف أدى إلى حدوث زيادة معنوية عند مستويات معنوية ٠.٠٥ و ٠.٠١ فى تركيز الهيموجلوبين فى الدم وايضا تحسنت الحالة الهستولوجية للامعاء الدقيقة حيث زاد طول وعرض الخملات عند مستوى معنوية ٠.٠١ فى المجموعات التى عوملت باضافة املاح الصفراء بالمستويات المختلفة، من هذه الدراسة نستخلص ان املاح الصفراء لها تأثير ايجابى على تركيز هيوجلوبين الدم والحالة الهستولوجية والمورفولوجية للامعاء الدقيقة لبدارى التسمين.

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