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## **Effect of vitamin A on Some Productive , Physiological and histological traits of the local ducks (*Anas pater hycous*)**

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### **Abstract**

Ninety, one old local duckling that weighed 50 g were randomly divided into 3 groups with 3 replicates per treatment. The aim of this study was to investigate the influence of increased vitamin A levels on the production performance, some physiological traits and histological characteristics . Supplemental levels were: 4000, 8000 IU and 0 vitamin A dissolved in sunflower oil was given directly into the mouth via syringe for twice during the first week after hatch . Vitamin A levels had no significant ( $P < 0.05$ ) effect on feed intake and relative heart and liver weight . Supplemented with 8000 IU vitamin A increased the body weight and weight gain significantly ( $P < 0.05$ ) and improved feed conversion ratio more than supplemented with 0 IU vitamin A . The influence of vitamin A 8000IU on hemoglobin concentration , PCV and erythrocyte count was significantly increased ( $P < 0.05$ ) ( $P < 0.01$ ) respectively at 7 weeks of age. But had no significant ( $P < 0.05$ ) effect on the percentage of lymphocytes , granular and monocytes cells . In addition, vitamin A had no significant ( $P < 0.05$ ) effect on serum thyroxin hormone , glucose and cholesterol levels . Histological study showed that villi height , crypt depth were increased as vitamin A supplement increased (4000 , 8000 IU) . In conclusion, feed supplemented ducks with 8000 IU vitamin A led to better growth rate and better performance of local ducks.

**Key words (Vitamin A , Weight , Physiological traits , Duckling).**

## **1.Introduction**

Today the poultry industry is witnessing series of problems such as various disease outbreaks, harsh climatic conditions, high cost of feeding and day by day decreasing profit margin ,the success of broiler production depends on maximum weight gain within minimum period and which can be fulfilled by proper nutritional and managerial practices , so as to increase the growth performance of the birds various nutrients are to be incorporated in the diet. (2).

Vitamins requirements of animals depend greatly on their physiological make-up, age, health, and nutritional status and function, such as producing meat or eggs , Breeder hens have higher vitamin requirements for optimum hatchability, since vitamin requirements for egg production are generally less than those for egg hatchability (9).

Vitamin A is necessary to support growth, health, and the life of higher animals, In the absence of vitamin A, animals will cease growth and

eventually die , therefore it is of primary important in development of young, growing animals (8).

Vitamin A, known for its role in the differentiation of epithelial cells and essential for integrity of mucosal surfaces (22). Vitamin A is anti-mutagenic, both *in vivo* and *in vitro* to prevent aflatoxin induced liver damage (4) . In addition the supplementation of the diet with Vitamin A partially decreased these negative effects of toxic of alfatoxin B1 (10). Abnormal intake of dietary vitamin A causes keratinization and drying of the epithelial in the gastrointestinal tract, respiratory tract and ocular surface (11).

The nutritional requirements of ducks aged 0-7 weeks for Vitamin A is 2500 IU/kg NRC (7). Because previous studies mainly focused on the effect of the deficiency of vitamin A on birds performance , it is necessary to further investigate the influence of increased vitamin A levels on the production performance , some physiological traits and histological characteristics .

## **2.Experimentalals**

The study was carried out at the poultry farm of Animal farm, Agricultural Researches station , Agricultural College , Basrah

University, Basrah – Iraq. The experiment was extended from March to May of year 2013.

### **Experimental birds and management:**

A total of ninety, Day-old local ducklings with an average weight of 50 g were purchased from a reputable hatchery in Basrah city , Iraq , early March of year 2013 and brooded for seven weeks on cages .

The ducks of two days old were randomly divided into 3 treatments with 3 replicates per treatment . The

treatments were given via their mouth by syringe twice during the first week after hatch (T1); 4000 IU vitamin A , (T2); 8000 IU vitamin A after dissolved in sunflower oil , (T3); sunflower oil only (Control) . The dose was 2ml once. Feed and water were allowed ad libitum.

**Table 1. Composition of the basal diets.**

Ingredients	Diet 1(0-3week) Amount ( % )	Diet 2 (4-7 week) Amount ( % )
yellow corn	60	60
Wheat bran	10	10
Sesame meal	5	5
Soybean meal (44%)	1	-
Bean morsel	10	10
Protein concentration	10	10
Fish meal (72%)	-	1
Limestone	0.5	0.5
Vitamin – mineral premix*	3.5	3.5
Calculated composition		
ME, kcal/kg	3008.44	3059.08
Crude protein(%)	18.67	18.58
Crude fat	3.45	3.60
Crude fiber	3.31	3.18
Ash	6.22	5.78
Calcium	1.03	0.88
phosphorus	0.67	0.69
Available phosphorus	0.42	0.45
Sodium	0.16	0.17
Lysine	0.80	0.79
Methionine + Cystine	0.70	0.71

\* Vitamins in amounts per kg diet: Vit.A: 2500 IU, Vit.D3: 5000IU, Vit.E: 75mg, Vit.K: 3mg, Vit B1: 3 mg, Vit B2: 8 mg, Vit B6: 5 mg, Vit B12: 0.016 mg, folic acid: 2mg, biotin: 0.20mg, pantothenic acid: 13mg, Nicotinic acid :55mg, Choline chloride 1600mg.

\* Mineral composition (mg kg diet): Cooper :16mg, Iodin:1.25mg, Iron:40mg, Manganese:120mg , Selenium: 30mg, Zinc 100mg.

**Studied parameters:**

**Live body weight:** Ducks were weighed in groups by using electric weighing scale and later at the completion of each week .The weight of ducks was taken in the morning before offering feed and water to them.

**Weight gain:** Weight gain was calculated by the subtraction previous weight from later weight.

**Feed conversion ratio:** (FCR) was calculated as ratio of consumed feed to weight gain .

**Feed intake :**Feed was provided *ad libitum* to the ducks, given twice daily and refusal of feed was collected from feeders of each group and weighed and finally consumed feed was noted daily .

**Relative weights of the organs:**

On 7 weeks age , three birds from each replicate were randomly selected and slaughtered by exsanguinations . Live weight , weights of liver and heart were taken . Relative weights of the internal organs were calculated as

organs weight divided by live weight multiplied by 100 (13) .

**Physiological traits :**

At 7 weeks age ,the blood samples of four birds from each replicate were collected with and without anticoagulant for hematological and serum biochemical studies, respectively. Hematological parameters including the total erythrocyte count , hemoglobin , hematocrit (PCV) , percentage of lymphocytes , granular and monocytes cells were determined by the veterinary hematology analyzer (Mindray Company, China) . Biochemical parameters including concentration of thyroxin hormone , total cholesterol and glucose according to commercial kits which provider from French Biochech ,inc company.

**Tissues used for the histological study :**

Three parts from the middle of the duodenum (about 0.5 cm in length) per treatment were collected, corresponding to the three replicates per treatment.

### **Preparation of tissues for histological study:**

The tissues obtained from the ducks were fixed in the "Bouins fluid" (12) for 24 hours and were dehydrated in the series of ascending grade of alcohol followed by clearing in three changes in xylene, and the tissues then infiltrated with different grades of melted paraffin in the oven. The tissues were then embedded in paraffin and finally the sections were cut at 5 $\mu$  thickness using sliding microtome (MIC 509, Euromex , Japan). After cutting, the sections were floated on luke-warm water in a floatation bath at 37<sup>0</sup> C for stretching and then the sections were mounted on clean slides using an adhesive (Egg

### **3.Results and Discussion :**

Groups supplemented with Vitamin A (T2 group) recorded significantly (P<0.05) higher body weights and weight gain over the first treatment and control . The means being 1065, 932 and 940 g and 1015 , 882 and 890 g for T2, T1 and T0 control group respectively. These results were in agreement with those of Sahin *et. al* .(15) who emphasized a significantly increased of male broiler weight that fed a diet supplemented with vitamin A (15000 IU).

In addition , vitamin A supplemented group (T1,T2) recorded non-significant difference in feed consumption with the control group ,the averages being 2747 , 2705 and 2934 g respectively. In this experiment, body weight and gain was significantly decreased (P<0.05) in ducks fed T0 (no vitamin A supplement) compared with T2 , but

albumins) and dried on a slide warmer at 37<sup>0</sup> C. The sections were stained using Mayer's Hematoxylin and Eosin (H & E). The histological structures of the duodenum tissues were observed using light microscope under low ( $\times 10$ ) magnification. Then the measurements of different histological structures of the duodenum tissues (high villus and depth crypt ) were performed by the calibrated stage micrometer in  $\mu$ m (micrometer).

### **Statistical methods:**

All data obtained were subjected to one-way analysis of variance using with the program of statistical analyses (SPSS) (19).

feed intake was not affected by treatments . The final difference in weight and weight gain despite equivalent intake of feed , may have been due to Vitamin A level which is positively correlated with the growth of birds (8) .

Vitamin A (T2 ) supplemented group showed better feed efficiency over the control group T0. The means being 2.67 and 3.29 for T2 and T0 groups respectively. These findings of improvement in feed efficiency are in agreement with the findings recorded by Sayed and Abdel Ghaffer (1). Relative weight of liver and heart of all treatments were nearly similar . In agreement with our results, Akbari *et. Al*. (14) found no significant relative weights of liver of broiler chickens that fed a diet supplemented with vitamin A.

**Table (2) Production traits at 7 weeks of age as influenced by vitamin A supplementation (mean ± stander error)**

Treatment Traits	Body Weight (g)	Body Weight gain (g)	Feed intake(g)	Feed efficiency (FCR)	Liver %	Heart %
T1 (4000) IU Vit. A	932 ± 28.71 b	882 ± 28.71 b	2747 ± 113.01	3.11 ± 0.07 ab	0.022 ± 0.0005	0.0045± 0.0000
T2 (8000) IU Vit. A	1065 ± 28.57 a	1015 ± 28.57 a	2705 ± 110.39	2.67 ± 0.17 a	0.028 ± 0.0026	0.0043± 0.0002
T3 (Control)	940 ± 14.99 b	890 ± 14.99 b	2934 ± 145.60	3.29 ± 0.10 b	0.023 ± 0.0028	0.0046± 0.0000
	*	*	N.S	*	N.S	N.S

\*Means within a column with different letters differ significantly (P<0.05).  
N.S = non-significant .

As follows from results of the table 3, when compared with the control, T2 ducks exhibited a highly significant increase in erythrocyte count (P < 0.01) . These results could be due to the important functions vitamin A on hematopoiesis and differentiation of epithelial cells (5) , There was a significant increase(P < 0.05) in hemoglobin and pact cell volume level

. These results , may have been due to a significant positive relationship that found between erythrocyte numbers and hemoglobin content and hematocrit value (18).The observations recorded in the present study are in agreement with those reported by Zhang *et. al.* (3). The results had no significant (P<0.05) effect on the percentage of lymphocytes , granular and monocytes cells .

**Table (3) blood parameters at 7 weeks of age as influenced by vitamin A supplementation (mean ± stander error)**

Treatment Traits	RBC 10 <sup>6</sup> /mm <sup>3</sup>	PCV%	HB mg/dl	Lympho. cells %	Granular cells %	Monocytes %
T1 (4000) IU Vit. A	2.49 ± 0.03 b	29.18± 0.61 b	11.53 ± 0.24 b	83.22 ± 1.26	5.62 ± 1.02	11.12 ± 0.23
T2 (8000) IU Vit. A	3.50 ± 0.13 a	31.10± 0.69 a	12.99 ± 0.48 a	83.27 ± 0.75	5.92 ± 0.34	10.80 ± 0.53
T3 (Control)	2.45 ± 0.14 b	28.70± 0.31 b	11.28 ± 0.51 b	85.92 ± 0.31	4.40 ± 0.16	10.35 ± 0.19
	**	*	*	N.S	N.S	N.S

\*\* Means within a column with different letters differ significantly (P<0.01)  
\*Means within a column with different letters differ significantly (P<0.05).  
N.S = non-significant.

The effects of vitamin A on serum Thyroxin hormone , Glucose and Cholesterol of local Duckling at 7 weeks of age are shown in Table 4. Vitamin A had no significant effects on these parameters measured in the present study . Similar observations were also recorded by Zhang *et. al* (20)

who reported non-significant difference in thyroxin hormone serum concentration in growing layer ducks which fed different level of vitamin A. Similar results were also observed by Sahin *et. al.* (15) who reported non-significant difference in cholesterol serum concentration .

**Table (4) Effect of vitamin A on Thyroxin hormone , Glucose and Cholesterol Serum of local Duck at 7 weeks of age (mean ± stander error)**

Treatment Traits	Thyroxin hormone (ng/dl)	Glucose (mg/dl)	Cholesterol (mg/dl)
T1 (4000) IU Vit. A	3.67 ± 0.59	162.09 ± 5.02	229.30 ± 54.78
T2 (8000) IU Vit. A	4.08 ± 0.27	142.81 ± 17.46	230.59 ± 49.45
T3 (Control)	3.53 ± 0.20	138.88 ± 19.48	213.78 ± 46.44
	N.S	N.S	N.S

**N.S = non-significant**

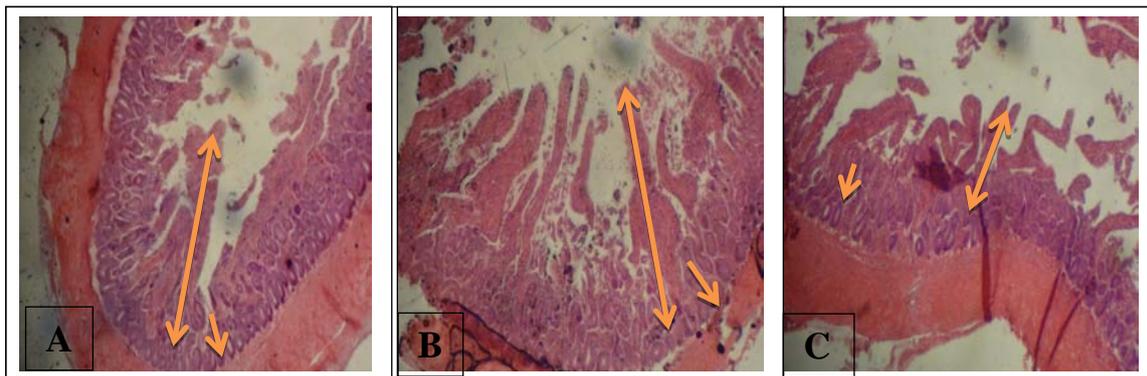
Data for intestinal villus height and crypt depth in the present study are presented in Table 5. Villus height and crypt depth increased to 76.83 , 65.00 and 73.00 ,58.50 µm of birds of groups T1 , T2 respectively, The lowest villus height and crypt were observed in birds of control group 45.83 , 33.33 µm. Similar observations were also recorded by Moghaddam *et. al.* (17) who reported villi height and crypt depth increased as dietary vitamin A supplement increased . These results , may have been due to vitamin A deficiency that caused a decreased in the number of goblet cells and villus height ( 6) , whereas Vitamin A and its

derivates are required for maintenance of various epithelial tissues at the appropriate differentiated stages and small intestine is one of the tissues exhibiting rapid cell proliferation and differentiation (23 ). Assessment of intestinal villus morphology is important because the small intestine is the primary site for nutrient assimilation and is therefore sensitive to changes in the diet (7). Measuring villus height and crypt depth are established ways of investigating intestinal morphology and functional capacity (21).

**Table (5) Effect of vitamin A on Villus height and Crypt depth of local Duck at 7 weeks of age (mean ± stander error)**

Treatment Traits	Villus Height µm	Crypt depth µm
T1 (4000) IU Vit. A	76.83 ± 2.95 a	65.00 ± 2.20 a
T2 (8000) IU Vit. A	73.00 ± 3.14 a	58.50 ± 2.48 a
T3 (Control)	45.83 ± 4.54 b	33.33 ± 2.78 b
	**	**

**\*\* Means within a column with different letters differ significantly (P<0.01)**



**Fig.1:Duodenum villus and crypts in duckling treated with vitamin A , (A) first treatment 4000 IU vitamin A , 40X E&H (villus height and crypts depth were increased compared with control treatment) , (B) second treatment 8000 IU vitamin A, 40X E&H (villus height and crypts depth were increased compared with control treatment) , (C) third treatment (control) without vitamin A , 40X E&H .**

↔ villus height.  
 → crypts depth

#### **4.Conclusions:**

From all the results above, we could conclude that the optimum supplemental levels of vitamin A should be 8000 IU for 7 weeks of age

for duckling to get better production performance.

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تأثير فيتامين A في بعض الصفات الانتاجية والفسلجية والنسجية للبط المحلي  
(*Anas pater hycous*)

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بصرة/العراق

الخلاصة

استعمل تسعون فرخ بط محلي بعمر يوم واحد وبمعدل وزن 50 غرام وزعت عشوائياً على ثلاث معاملات ويواقع ثلاثة مكررات لكل معاملة وذلك لمعرفة تأثير زيادة مستويات فيتامين A في بعض الصفات الانتاجية والفسلجية والنسجية للبط المحلي ، اعطيت الطيور الفيتامين مباشرة وبتركيز 4000 و 8000 و صفر وحدة دولية بعد اذابته بزيت زهرة الشمس عن طريق الفم بواسطة محقنة طبية ولمرتين خلال الاسبوع الاول بعد الفقس ، اشارت نتائج الدراسة الى عدم تأثر كمية العلف المستهلكة والاوزان النسبية للقلب والكبد معنوياً بإضافة فيتامين A ( $0.05 > A$ ) في حين حصلت زيادة معنوية ( $0.05 > A$ ) في معدلات وزن الجسم والزيادة الوزنية مع تحسن معنوي ( $0.05 > A$ ) في كفاءة التحويل الغذائي في طيور المعاملة الثانية (8000 وحدة دولية) مقارنة بطيور مجموعة السيطرة ، فضلاً عن زيادة معنوية ( $0.01 > A$ ) و ( $0.05 > A$ ) في عدد خلايا الدم الحمر وتركيز خضاب الدم وحجم الخلايا المرصوصة على التوالي عند الاسبوع السابع من عمر الطيور. بينما لم تظهر فروقات معنوية ( $0.05 > A$ ) في نسبة الخلايا اللمفاوية والحيبيبية والاحادية ، فضلاً عن عدم تأثر تركيز هرمون الثايروكسين وكلوكون وكوليسترول مصل الدم معنوياً ( $0.05 > A$ ) ، و اشارت نتائج الدراسة النسيجية الى حصول زيادة معنوية ( $0.05 > A$ ) في طول الزغابة وعمق الخبايا في امعاء طيور المعاملتين الاولى والثانية (4000 و 8000 وحدة دولية) مقارنة بأمعاء طيور مجموعة السيطرة . نستنتج من الدراسة الحالية ان زيادة مستوى فيتامين A وبتركيز 8000 وحدة دولية عن الحدود الموصى بها تؤدي الى رفع معدلات النمو والاداء الانتاجي للبط المحلي.

الكلمات المفتاحية (فيتامين A ، الوزن ، الصفات الفسلجية ، البط)