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EFFECT OF ADDING DIFFERENT LEVELS OF ARABIC GUM (ACACIA SENEGAL) TO DRINKING WATER ON SOME PHYSIOLOGICAL AND MICROBIAL CHARACTERISTICS OF BROILER

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ABSTRACT

This study was conducted in the poultry field of the Animal Production Department of the College of Agriculture/ University of Karbala for a period of 35 days 21/11/2021 to 25/12/2021, in order to demonstrate the evaluation of the addition of different level of powdered Arabic gum (Acacia Senegal) added to Drinking water for broiler chickens showed some physiological and microbial characteristics, as 150 Ross308 broiler chicks, one day old, unsexed, were used, and the average weight of the chicks was 38 gm, distributed randomly to 5 treatments, and each treatment had 3 replications of 10 chicks for each replicate, and the addition of Arabic gumto the ration and from the first day my agencies: T1: control treatment without addition, T2: add 1.25 gm of Arabic gum/ liter of water, T3: add 2.25 gm of Arabic gum/ liter of water, T4: add 3.25 gm of Arabic gum/ liter Water, T5: add 4.25 g of Arabic gum/ liter of water.

key words: microbial traits, Acacia Senegal and broiler.

تأثير إضافة مستويات مختلفة من الصمغ العربي (أكاسيا السنغال) إلى ماء الشرب في بعض الصفات الفسيولوجية والميكروبية لفروج اللحم

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الخلاصة

أجريت هذه الدراسة في حقل الدواجن التابع لقسم الإنتاج الحيواني لكلية الزراعة/ جامعة كربلاء ولمدة 35 يوما 2021/11/21 ولغاية 12/25/ 2021، وذلك لبيان تقييم اضافة مستويات مختلفة من مسحوق الصمغ العربي (Acacia Senegal) المضاف الى ماء الشرب لفروج اللحم على بعض الصفات الفسلجية والمايكروبية، اذ تم استخدام 150 فرخ فروج لحم نوع Ross308 بعمر يوم واحد غير مجنس، وكان متوسط وزن الافراخ 38 غم وزعت بصورة عشوائية على 5 معاملات وكل معاملة 3 مكررات بواقع 10 فرخا" لكل مكرر، تم إضافة الصمغ العربي الى العليقة ومنذ اليوم الأول وكالاتي : T1: معاملة السيطرة بدون إضافة، T2: إضافة 1.25 غم من مسحوق الصمغ العربي/ لتر ماء، T3: إضافة 2.25 غم من الصمغ العربي/ لتر ماء، T4: إضافة 3.25 غم من الصمغ العربي/لتر ماء، T5: إضافة 4.25 غم من الصمغ العربي/ لتر ماء.

الكلمات المفتاحية: الصفات الميكروبية، اكاسيا السنغالي ودجاج التسمين.

*The article is taken from the doctoral thesis of the first researcher.

INTRODUCTION

Diets are one of the main and important factors for meeting the energy and protein needs of domestic birds **(Titus &Fritz, 1971),**and the fact that nutrition is important in the development of the poultry industry and its contribution to the processing of nutrients that the bird needs for growth and production, as well as reproduction through balanced diets **(Abdul Abbas *et al.* 2007; Alfahad & Lazim, 2019 ; Al-Mashhadani & Al-Rubaie, 2021)**, various methods were used for the purpose of providing raw materials that enter into the formation of diets **(Abdul Abbas *et al.*, 2014).** Also, "the nutritional value of these diets can be improved by using methods of soaking the main nutrients that make them up, or adding digestive enzymes, which in turn contribute to improving the production performance of broilers or egg chickens, or using different fermentation methods that increase the vital energy of the nutrients that make up the diet **(Al-Rubaee *et al.*, 2017; Al-Mashhadani *et al.*, 2019).** In addition to the nutrients, the diet contains a group of food and non-food additives, and among the habits that are practiced all over the world in poultry farming are the non-food additives represented by Antibiotic Growth Promoters, where some researchers found that the addition of antibiotic growth promoters In broiler diets, it has a negative effect on microbial colonies in the first days after hatching **(Schokker *et al.*, 2017)**, but at the same time, according to the researcher Smith, **(Smith, 2019)** as he demonstrated its high ability to improve gut health, prevent bacterial pathogens, and promote growth. However, due to bacterial resistance and increased consumer demand for antibiotic-free products, this led to a decrease in their use in poultry diets **(Xiong *et al.*, 2018)** , Therefore, its use in poultry diets was banned by the European Union **(Belal *et al.*, 2018)**, and this matter encouraged researchers to find alternative methods and search for more natural and safe nutritional supplements such as medicinal plants and herbal products **(Amein *et al.*, 2019; Azzam *et al.*, 2020; Al-Masari & Al-Himdany, 2022)**, On the other hand, these supplements are useful in promoting early growth and digestive system development in broiler chickens **(Berrocoso *et al.*, 2017)**. Arabic gumis a natural supplement, and it is the dried gum secretions obtained from the stems and branches of Acacia Senegal or other related African species of acacia. These trees are abundant in central Sudan, central Africa and western Africa **(Assimon & Stein, 1994)**. Arabic gumis a natural biomaterial as a result of it containing high-molecular glycoproteins, and upon hydrolysis of the gum we get arabinose, galactose, rhamnose, and glucuronic acid selectively that stimulate the growth and activity of beneficial bacteria through fermentation in the two cecums. In addition, the gum contains substances Organic, amino acids and minerals **(Khalid *et al.*, 2014)**. Arabic gum has been used as a therapeutic agent for the purpose of covering irritated surfaces and for the treatment of irritation of the internal gastrointestinal mucosa. It also has anti-inflammatory and antioxidant properties **(Rehman *et al.*, 2001; Gamal *et al.*, 2003; Ali *et al.*, 2008)**.

Gum Arabic has many benefits. It is considered a blood sugar inhibitor. Among its benefits, it is also used as an alternative to drugs and antibiotics. Because the medicines used in poultry are expensive and are prepared by international standards, we decided to use it in our experiments in different proportions to find the best proportions to include in improving poultry farming, especially physiological performance.

MATERIALS AND METHODS

This study was conducted in the poultry field of the Department of Animal Production, College of Agriculture/ University of Karbala, for a period of 35 days,(21/11/2021 to 25/12/2021), to evaluate the addition of different percentages of Arabic gum powder (Acacia Senegal) to water. Drinking for broiler chickens in some physiological characteristics, as 150 non-sexed Ross 308 broiler chicks were used, distributed randomly into 5 treatments, with 3 replications for each treatment and each repetition of 10 chicks, distributed within pens with dimensions of 1 × 1 m2. Arabic gum was added to the diet, and from the first day of the experiment, the treatments were as follows.

T1: control treatment without addition
T2: add 1.25 g of Arabic gum/ liter of water.
T3: add 2.25 g of Arabic gum/ liter of water.
T4: add 3.25 g of Arabic gum/ liter of water.
T5: add 4.25 g of Arabic gum/ liter of water.

The chicks were fed starter diet (22.03% protein and 2914.25 kilocalories/kg of feed) from the age of one day until the third week of the birds' life, after that they were replaced with growth diet (19.87% protein and 3014.95 kilocalories/kg of energy). fodder) until the end of the fifth week, and the fodder was provided freely ad libitum. Table No. (1) shows the diet used:

Table (1): Percentages and chemical composition of the starter and finisher diets for broiler from (1-35) days.

The components	Starter diet (1-21) days	Finishers diet (22-35) days
yellow corn	gm50	gm 45
Wheat	gm 12	gm 22
Protein concentrate *	gm 5	gm 5
Soybean meal*	gm 30	gm 24
limestone	gm 1	gm 1
Sunflower oil	gm 1	gm 2
Dicalcium phosphate*	gm 1	gm 1
Total	gm 100	gm 100

Calculated chemical composition**

Crude protein %	22.03	19.87
Represented energy (kilo cal/kg feed)	2914.25	3014.95
Lysine (%)	1.24	1.088
Methionine (%)	0.494	0.459
Cysteine (%)	0.353	0.323
Methionine and cysteine (%)	0.847	0.782

Calcium (%)	0.75	0.75
Available phosphorous (%)	0.312	0.312
Energy/protein ratio (%)	132.67	152.31

*** Use the Wafi protein concentrate, which is a Dutch-made product, containing 40% crude protein and 2117.00 K. As represented energy / kg of feed, fat 5%, raw fiber 2.81%, ash 23.45%, calcium 3.14%, phosphorus 2.65%, chloride 3.88%, methionine 3.7%, methionine + cysteine 4.12%, lysine 3.85%, sodium 2.5%, threonine 1.8%, leucine 1.45%, valine 1.69% and arginine 2.48 % and contains a group of vitamins, including B1 60 mg, B2 140 mg, B6 80 mg, vitamin B12 700 mg, vitamin A 200,000 IU, vitamin D3 80,000 IU, vitamin E 600 mg, vitamin k3 50 mg, niacin 800 mg, biotin 2 mg, folic acid 20 mg, choline 6.07 It also contains calcium 300 mg, copper 200 mg, manganese 1600 mg, zinc 1200 mg, iron 1000 mg, iodine 20 mg, selenium 5 mg and antioxidants.**
*** Soybean meal is of Argentine origin. Dicalcium phosphate 18%.**
**** The calculated chemical composition of the components of the boiler according to what was stated in Netional research council.1994.**

RESULTS AND DISCUSSION

1. Serum concentrations of uric acid, AST, ALT, creatine, calcium and phosphorus

The results of Table (2) indicate the addition of different percentages of Arabic gumpowder to the drinking water of broiler chickens, and its effect on the concentration of uric acid, the enzymes transporting the amino group Alanine aminotransferase and Aspartate aminotransferase (AST and ALT), creatine, calcium and phosphorus to blood serum, differences were found between the addition treatments And control treatment, but no significant differences were recorded (P≤0.05). And the absence of significant differences in the characteristics mentioned above in general may be due to the relative stability of the variables that affect the concentration of uric acid and the enzymes that transport the amine group, calcium and phosphorus with regard to the conditions of the experiment such as temperature and humidity **(Yasin, *et al*., 1990)**.

Table (2): Evaluation of the addition of different percentages of Arabic gum powder in serum concentrations of Chemical properties (mean ± standard error)**.**

Treatments	Uric asid U/L	AST U/L	ALT U/L	Crytenine U/L	Calicium U/L	Phosphor U/L
T1	0.71 ± 6.7	± 139.83 10.02	0.33 ± 6.45	0.04 ± 0.48	0.91 ± 9.64	0.27 ± 6.4
T2	0.23 ± 6.71	± 134.56 3.77	0.39 ± 6.07	0.01 ± 0.71	0.36 ± 10.55	0.12 ± 6.02
T3	0.11 ± 6.2	± 137.61 4.81	0.18 ± 6.36	0.07 ± 0.65	0.37 ± 10.6	0.79 ± 5.92
T4	0.24 ± 6.78	± 136.07 3.01	0.37 ± 6.6	0.12 ± 0.65	0.31 ± 10.15	0.35 ± 6.4
T5	0.26 ± 6.01	± 134.31 2.91	0.11 ± 6.07	0.08 ± 0.66	0.34 ± 10.23	0.06 ± 5.9
Significant level	N.S	N.S	N.S	N.S	N.S	N.S

Significance level: the different letters within one column indicate that there are significant differences at the probability level of 0.05, and N.S means that there are no significant differences between the treatments.
Transactions T1: control without addition, T2: adding 1.25 g/l of Arabic gumpowder to the feed, T3: adding 2.25 g/l of Arabic gumpowder to the feed, T4: adding 3.25 g/l of Arabic gumpowder to the feed, T5: add 4.25 g / liter of Arabic gumpowder to the water.

2. The concentration of glucose, cholesterol, triglycerides, high-density lipoprotein (HDL) and low-density lipoprotein (LDL) in the blood serum.

The results of table (3) did not show the presence of significant differences between the treatments when adding different percentages of Arabic gumpowder to the drinking water of broiler chickens and the effect on the concentration of glucose, cholesterol, triglycerides, HDL and LDL, as there were arithmetic differences among the treatments.

Table (3): Evaluation of the addition of different percentages of Arabic gum powder in the concentration of glucose, cholesterol, triglycerides, high-density lipoproteins (HDL) and low-density lipoproteins (LDL) in blood serum (mean ± standard error).

Treatments	glucose mg/100ml	cholestrol mg/100ml	Triglycerides mg/100ml	High density lipoprotein mg/100ml	Low density lipoprotein mg/100ml
T1	4.42 ± 168.14	2.54 ± 145.13	4.21 ± 146.43	2.37 ± 64.75	2.35 ± 61.94
T2	0.51 ± 162.42	1.86 ± 145.49	4.56 ± 143.78	2.65 ± 63.29	2.25 ± 64.88
T3	4.25 ± 155.61	1.81 ± 140.48	2.95 ± 143.31	1.51 ± 64.61	1.81 ± 64.09
T4	6.61 ± 161.82	1.28 ± 142.42	2.43 ± 145.61	0.38 ± 63.46	3.13 ± 62.42
T5	6.14 ± 160.65	3.05 ± 143.02	0.64 ± 140.47	2.05 ± 61.48	2.41 ± 62.23
Significant level	**N.S**	**N.S**	**N.S**	**N.S**	**N.S**

Significance level: the different letters within one column indicate that there are significant differences at the probability level of 0.05, and N.S means that there are no significant differences between the treatments.

Transactions T1: control without addition, T2: adding 1.25 g/l of Arabic gumpowder to the feed, T3: adding 2.25 g/l of Arabic gumpowder to the feed, T4: adding 3.25 g/l of Arabic gumpowder to the feed, T5: add 4.25 g / liter of Arabic gumpowder to the water.

Evaluation of the addition of different percentages of Arabic gumpowder to the Ross 308 broiler ration on blood microbial characteristics.

The results of Table (4) show that there is a significant decrease (P≤0.05) among all treatments in the logarithmic count of E-coli bacteria compared to the control treatment, as well as significant differences (P≤0.05) were found with a superiority in the treatments T5, T4, T3 over the control treatment and did not differ Significantly higher than the T2 treatment in the logarithmic count of Lacto bacilli in the broiler coils, we noticed by reviewing the results of our study and noting the significant increase in the number of lactobacillus (Lactobacillus) in the addition treatments may be due to the effective and important role played by Arabic gumin the fermentation of insoluble fibers For digestion **(Pourabedin & Zhao, 2015)** and this in turn is due to an improvement in the health of the gastrointestinal tract by enhancing the numbers of bacilli.

Or the reason may be due to the increase in lactic acid through the fermentation of the fibers by the action of Arabic gumand thus lowering the pH and increasing the growth of bacterial communities, and that lactic acid is a by-product of the bacteria (Lactobacillus) **(Alvares *et al*., 2016)** The same reason affected the growth of E-coli bacteria and also that the decrease pH in the gut inactivates sensitive pathogens **(Pelicano *et al*., 2005)** .

Table (4): Evaluation of adding different percentages of Arabic gumpowder to broiler diet and its effect on the microbial count of E-coli and Lacto bacilli in the ileum.

Treatments	*E . coli*	*Lacto bacilli*
T1	a 0.17 ± 7.05	b 0.31 ± 5.85
T2	b 0.26 ± 5.87	ab 0.18 ± 6.26
T3	b 0.41 ± 5.77	a 0.22 ± 6.70
T4	b 0.23 ± 5.16	a 0.19 ± 6.73
T5	b 0.17 ± 5.63	a 0.14 ± 7.01
Significant level	*	*

Significance level: the different letters within one column indicate that there are significant differences at the probability level of 0.05, and N.S means that there are no significant differences between the treatments.
Transactions T1: control without addition, T2: adding 1.25 g/l of Arabic gumpowder to the feed, T3: adding 2.25 g/l of Arabic gumpowder to the feed, T4: adding 3.25 g/l of Arabic gumpowder to the feed, T5: add 4.25 g / liter of Arabic gumpowder to the water.

CONCLUSIONS

The statistical analysis table shows that there are mathematical differences between the addition swap and the control factor, and there are significant differences in the concentration of uric acid, aminotransferase enzymes (AST and ALT), creatine, calcium. and phosphorus in the blood, and glucose in the blood There are no significant differences in the level and concentration of the triple dose and the various high-concentration proteins (HDL) between the treatments, but the results show that the microbial counts of E. coli and lactobacilli in the ileum show significant differences.
($p \leq 0.05$).

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