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EVALUATION OF GENETIC DIFFERENCES ON IMMUNOLOGICAL RESPONSE IN TWO NATIVE CHICKEN STRAINS FED ON DIFFERENT NATURAL AND ORGANIC ACID SUPPLEMENTATION

[136]

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ABSTRACT

The main objective of this study was to investigate the effect of the genetic differences in immunological response by use the natural growth promoters in diets offered to local chicken strains (GoldenMontazah (GM) and Bandra (B)). The present study was carried out in Seds Poultry Breeding Research Station, Animal Production Research Institute, Banysweif Governorate, through August to January (2016). A total of 240 chicks (120 hens of each strain) were used from 16 to 40 weeks of age. Birds were randomly distributed into six treatments. Each treatment had 20 (female) chicks (20X 6X 2) that were individually caged. The first treatment of each strain served as a control group and fed the formulated basal diet without any tested feed additives. The second treatment fed the basal diet with BioPlus® 2B, (400gm/ton) a commercial probiotic preparation (pro. (Bio)). The third treatment hens were fed the same basal diet with the addition of TechnoMos® (500gm/ton) a prebiotic type (pre. (Tech)).The fourth treatment fed the basal diet with Diamond V®(2.5kg/ton) a commercial prebiotic produced (pre. (Dia)). The fifth treatment fed the basal diet with FORMI® NDF (2kg/ton) (organic acid (FORMI)). The sixth treatment fed the basal diet with combination of (BioPlus® 2B, (400gm/ton) + TechnoMos® (500gm/ton) + FORMI® NDF (1kg/ton)) (combination (BTF)).

Data showed that, the Heterophils/Lymphocyte ratio percentage value was significantly higher in Golden Montaza than Bandara. The highest value was found for organic acids (FORMI) group and the lowest value was found for probiotic (Bio Plus) group.

As for the antibody titer before vaccination the highest values were found for pre (Tech) group in comparison to pre (Dia) group. And there were no significant differences between the control group and all treated groups. Also, the higher values of antibody titer against Newcastle vaccine after vaccination were found in pre (Tech.), org ((FORMI), combination (Bio, Tech and FORMI) and control groups compare to values were found in pre (Dia) and pro (Bio) groups. As for the differences titer between before and after vaccination against Newcastle disease virus, there were no significant differences.

INTRODUCTION

Since two decades there has been great interest on finding alternate to antibiotics for poultry production. Microbes in the digestive system of birds have a deep effect on some physiological operations of the host. With this consideration, it is serious to understand the microbial ecology dynamics of the chicken intestines to find the best alternatives to antibiotics. Under normal conditions there is an accurate balance between beneficial bacteria and Bacteria that cause diseases in the gastrointestinal tract (GIT). This is affected by the interactions and relationships Synergistic and competitiveness. The microbial organism communities will not only safeguard the GIT but is also working to enhance productivity in the host.

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The use of probiotics, prebiotics and organic acids are Modalities that have been tested and can reduce intestinal diseases in poultry and also promote their productivity. These materials have been suggested to help prevent carcass contamination and improve immune response in chickens **(Huang et al 2004)**. Foods inclusive Probiotics and Prebiotics are in no way a new approach. Indeed, they have been consumed for centuries, either natural ingredients of food or fermented foods, for example yoghurt.

Probiotics has been known as “microbial live food supplements that affect the host animal in a beneficial way by amelioration the intestinal balance" **(Fuller, 1989)**. Probiotic action mode is by "competitive exclusion", meaning that there is competition on the attachment sites at the GIT. The probiotic bacteria attach to the mucosa in the intestine, thus forming a physical barrier that prevents the attachment of pathogenic bacteria **(Furlan, 2005)**. It also produces antibacterial vehicles and enzymes and stimulates the immune system.

Prebiotics are known to be indigestible food components that usefully affect the host by stimulating one growth and activity or a restricted number of bacteria in the colon **(Gibson and Roberfroid, 1995)**. The most widespread prebiotics are oligosaccharides, which are carbohydrates that are indigestible. The way that prebiotics work is through (1) Provision of nutrients for useful microbes, or (2) deceiving pathogenic bacteria into the oligosaccharide bind instead of the intestinal mucosa. This decreases the colonization of the intestine and thus reduces infection in birds. Because oligosaccharides are indigestible, the attached microbes will travel along the GIT with food, and secreted from the birds along with other indigestion food.

Organic acids and their salts are generally safe and have been confirmed for use as natural food additives in animal production **(Kamal and Ragaa, 2014)**. As alternatives to antibiotic growth promoters, organic acids (OA) have shown positive results in poultry production because of their ability to reduce intestinal pH and promote bacterial growth against Changes in acidity **(Ao et al 2009)**, thus providing better bowel health to the birds to maximize their nutrient absorption. Insert organic acids, for example formic and citric acids have been shown in poultry feed to enhance poultry performance **(Hassan et al 2016)**.

In addition, it has been reported that the feed of organic acids has many beneficial effects on feed conversion ratio, growth performance and enhanced mineral absorption **(Petruška et al 2012)** One important goal of food fermentation is to inhibit intestinal microbes competing with host for available nutrients, and decrease in potentially toxic bacterial metabolites. In this way, many studies have recommended that organic acids may affect the concentration of microorganisms in the ceca and small intestine **(Vogt et al 1982)** and that they are germicidal for salmonella in the crop **(Thompson and Hinton, 1997)**. Furthermore, organic acids work in creatures, as promoters of development, and may play a vital role in controlling certain microorganisms **(Wolfenden et al 2007)**.

Intestinal diseases are of major economic significance in the poultry industry. It leads to loss of productivity and increased mortality in flocks as well as potential contamination of poultry products, leading to concerns about the safety of human food. Antimicrobial use in poultry feed has been reduced due to concerns about resistance to bacterial antibiotics. The alternate to the antibiotics use in poultry feeding should be assessed strongly under field circumstances. Probiotics, prebiotics and formic acid as an example of organic acids are good alternative candidates.

Hence, the experiment aim was to estimate the influence of different feed additives (Probiotics, Prebiotic, Formic acid as an example of organic acids and Combination of probiotics, prebiotic and formic acid) on immunity and body's ability to resist disease and the response of the fortifications for local chicken strains.

MATERIALS AND METHODS

The present study was carried out in Seds Poultry Breeding Research Station, Animal Production Research Institute, Banysweif Governorate, through August to January (2016). The laboratory work of the present study was done at Poultry Breeding Department, Animal Production Research Institute (APRI), Agricultural Research Center, Ministry of Agriculture and Animal Health Research institute, Agricultural Research Center, Ministry of Agriculture, Dokki, Giza, Egypt.

1- Experimental Design

A total of 240 birds of two local strains, Golden Montazah (GM) and Bandra (B), (120 hens of each strain) were used from 16 to 40 wks of age to study the genetic differences in immunological response by use the natural growth promoters in the diets of local chicken strains.

At 16-week old (the beginning 0f experiment), birds were randomly distributed into six treatments. Each treatment had 20 chicks individual (female) (20X 6X 2) that were individually caged in double-sided. Feed and water were supplyed ad libitum. Ingredients and the chemical compositions of the experiment diet are shown in **Table (1)**. Birds were presented to the same conditions throughout the experimental period.

Table 1. Ingredients and the chemical Composition of the experimental diet

Item	**%**
Ingredient	
Yellow corn	63.50
Soybean meal (44%)	24.57
Wheat bran	2.00
DL- methionine	0.06
Sodium chloride	1.50
Premix*	0.30
Lime stone	7.77
Di-calcium phosphate	0.30
Total	**100%**
Calculated analysis**	
AMEn, kcal/kg	2,703
Crude Protein	16.0
Crude fiber	3.47
Crude fat	2.86
Lysine	0.89
Methionine	0.35
Methionine + Cystine	0.62
Calcium	3.32
Available phosphorus	0.41
Sodium	0.14

* Premixcontain per 3 kg: vit. A 12,000,000 IU; vit D3 3,000,000 IU; vit. E 50,000 mg; vit. K3 3,000 mg; vit. B1 2,000 mg; vit. B2 7,500 mg; vit. B6 3,500 mg; vit. B12 15 mg; Pantothenicacid 12,000 mg; Niacin 30,000 mg; Biotin 150 mg; Folicacid 1,500 mg; Choline 300 gm; Selenium 300 mg; Copper 10,000 mg; Iron 40,000 mg; Manganese 80,000 mg; Zinc 80,000 mg; Iodine 2,000 mg; Cobalt 250 mg; CaCO3 3,000 mg.

** According to Feed Composition Tables for Animal and PoultryFeedstuffsused in Egypt (2001).

The first treatment of each strain served as a control group and fed the formulated basal diet **(Table 1)** without any additive. The second treatment fed the basal diet with **BioPlus® 2B, (400 gm/ton)** a commercial probiotic preparation (pro. (Bio))was used in this study. The product contained 2 strains of bacilli. Bacillus licheniformis DSM 5749 and Bacillus subtilis DSM 5750, mixed in a 1:1 ratio. The third treatment hens were fed the same basal diet with the addition of **Techno-Mos®** (500gm/ton) a prebiotic type (pre. (Tech)) is extract derived from the cell walls of the baker yeast Saccharomyces cerevisiae, rich in mannanoligosaccharides (MOS) and Beta-1, 3-Glucanes.

The fourth treatment fed the basal diet with Diamond V® (2.5kg/ton) a commercial prebiotic produced (pre. (Dia by fermenting specific liquid and grain raw ingredients with baker's yeast (Saccharomyces cerevisiae) and drying the whole culture-media without causing any destructions to the yeast factors, B-vitamins and any other fermentation products. The fifth treatment fed the basal diet with FORMI® NDF (2kg/ton) is manufactured under paten-ted technology and is a unique combination of Formic acid and sodium formate (organic acid (**FORMI))**. The last treatment fed the basal diet with combination of (**BioPlus® 2B, (400 gm/ton) + TechnoMos® (500 gm/ton) + FORMI® NDF (1kg/ton)) (**combination **(BTF)).**

2- Measurements

Blood samples were collected from 3 hens (female) per each treatment at 40 weeks of age (the end of experimental), a total of 18 birds of each strain were randomly selected and massacred to evaluate the blood chemical constituents.

- H/L ratio: Blood was (0.3 mL) was collected in tubes containing EDTA as anticoagulant. A blood smear was prepared using MayGrunwald-Giemsa stain, and the number of H and L were counted to a total of 60 cells **(Gross and Siegel, 1983)**.
- Three birds from each treatment within each strain at the age of 38 a week were taken randomly and injected withIzovac ND vaccines. Two weeks after injection 3 blood samples from each treatment for each strain was taken to estimate the Immune response.

Blood was placed in dried test tubes for 30 minutes at room temperature in horizontal position to allow the blood to clot. The tubes were placed vertically in the refrigerator overnight to obtain a clear serum.

3- Statistical analysis

Data were analyzed using ANOVA 2-ways with interaction model as follows:

$$Y_{ijk} = \mu + S_i + B_J + SB_{ij} + e_{ijk}$$

Y_{ijk}=any observed value
μ = overall mean
S_i =effect of strain (i = 1 and 2; Golden Montazah and Bandara)
B_j= effect of feed additive (j= 1, 2, 3, 4, 5 and 6)
SB_{ij}= interaction effect between strain and feed additive
e_{ijk}= random deviation due to unexplained score

RESULTS AND DISCUSSION

Data of **Table (2)** represent the effect of supplementations of probiotic (Bio Plus), prebiotic (TechnoMos and Diamond), organic acid (FORMI® NDF) and combination (Bio Plus, TechnoMos and FORMI® NDF) on Leukocyte Countof females of Golden Montza and Bandara.

Table 2. Effect of supplementations of probiotic (Bio Plus), prebiotic (TechnoMos and Diamond), organic acid (FORMI® NDF) and combination (Bio Plus, TechnoMos and FORMI® NDF) on Leukocyte Count of females of Golden Montza and Bandara

Traits	Strain (S)	Treatment (T)						
		Con.	Bio.	Tech.	Dia.	F.	To.	Overall
HL%	GM	0.41±0.09	0.22±0.04	0.34±0.05	0.46±0.01	0.51±0.02	0.32±0.03	**0.38^{a}**
	B	0.28±0.01	0.23±0.04	0.24±0.01	0.26±0.03	0.41±0.04	0.26±0.01	**0.29^{b}**
	Overall	**0.34^{b}**	**0.25^{c}**	**0.29^{bc}**	**0.36^{b}**	**0.46^{a}**	**0.29^{bc}**	
H%	GM	27.7±4.33	17±2.45	23.7±2.60	29.3±0.67	31.3±0.67	23.7±1.86	**25.4^{a}**
	B	20.7±0.67	21±0.58	18.3±0.33	19.3±1.76	27.3±1.76	19.7±0.89	**21.1^{b}**
	Overall	**24.2^{b}**	**19.0^{c}**	**21.0^{bc}**	**24.3^{b}**	**29.3^{a}**	**21.7^{bc}**	
L%	GM	69.7±3.76	77.3±3.18	71.3±2.96	63.0±1.53	62.0±1.15	73.3±1.86	**69.4^{b}**
	B	75±0.58	75.3±1.76	75.0±0.58	75.3±2.40	67.7±2.73	67.7±2.73	**74.1^{a}**
	Overall	**72.3^{ab}**	**76.3^{a}**	**73.2^{ab}**	**69.2^{bc}**	**64.8^{c}**	**74.7^{a}**	
M%	GM	1.3±0.33	2.7±0.33	2.3±0.33	3.3±0.81	3.7±0.67	1.3±0.33	**2.4^{a}**
	B	2.7±0.67	2.3±0.88	2.7±0.33	3.0±0.58	2.0±0	2.0±0	**2.4^{a}**
	Overall	**2.0^{ab}**	**2.5^{ab}**	**2.5^{ab}**	**3.2^{a}**	**2.8^{ab}**	**1.7^{b}**	
E%	GM	1.7±033	3.0±0.58	2.0±0.58	3±0.58	3.7±0.67	1.7±0.33	**2.5^{a}**
	B	1.7±0.33	1.3±0.33	4.3±0.33	1.7±0.33	3.0±1	2.3±0.67	**2.4^{a}**
	Overall	**1.7^{c}**	**2.2^{abc}**	**3.2^{ab}**	**2.3^{abc}**	**3.3^{a}**	**2.0^{bc}**	

Pro.	S	T	S*T
HL%	0.0004	0.0002	0.0445
H%	0.0006	0.0004	0.0327
L%	0.0014	0.0003	NS
M%	NS	NS	NS
E%	NS	0.0315	0.0135

HL%: Heterophils/Lymphocyte ratio H%: Heterophils % L%: Lymphocyte %
M%: Monocyte % E%: Eosinophils %

Results in **Table (2)** cleared that differential Leukocyte Count was differed significantly ($p<0.05$) among different strains and treated groups.

Regarding Heterophils/Lymphocyte ratio percentage, it was significantly higher in Golden Montaza than Bandara. The highest value was found for organic acids (FORMI) group and the lowest value was found for probiotic (Bio Plus) group.On other hand, no significant differences were detected between (control), (Pre (Tech.)), (Pre (Dia.)) and combination (BTF)) groups.

Regarding heterophils percentage value, it was significantly higher in Golden Montaza than Bandara. The highest value was found for organic acids (FORMI) group and the lowest value was found for probiotic (Bio Plus) group.On other hand, no significant differences were observed between (control) and each of (Pre (Tech.)), (Pre (Dia.)) and combination (BTF)) groups.

Liza et al (2016) reported that heterophils percentage value, it was higher in all experimental groups (prebiotics, probiotics, synbiotics, organic acids and enzymes) of both breeds (Cobb and Ross breeds) than control group. The highest value was found for probiotic group of Ross breed (34.60%) and the lowest value was found for control group of Cobb breed (24.60).

Regarding Lymphocyte percentage value, it was significantly higher in Golden Montaza than Bandara. The highest value was associated with probiotic (Bio Plus) group while, the lowest value was found for organic acids (FORMI) group.

However, no significant differences were observed between (control), pro (Bio),(Pre (Tech.), and combination (BTF) groups and between (control), (Pre (Tech.) and (Pre (Dia.) groups.

Several studies demonstrated that organic acids can stimulate the natural immune response in poultry. Improvements in immunity of bird may be related to the inhibitory effects on intestinal pathogens system by organic acids **(Ghazala et al 2011)**. **Chowdhury et al (2008)** mentioned that the broiler chickens fed on citric acid lead to a high density of lymphocytes in the cecal tonsils and ileum. Accordingly, the improvement possibility of both humeral and cellular immunity due to dietary organic acids has been raised.

Liza et al (2016) reported that of Lymphocyte percentage, the highest value was found for organic acid group of Ross breed (69.33%) and the lowest value was found for probiotic group of Cobb breed (52.80).

Haque et al (2010) stated that the lymphocyte cells of broilers, were increased suggesting an increased level of immunity with organic acid supplementation. **Al Saad et al (2014)** indicated that there was a significant increase in the number of white blood cells (WBC) in blood samples from the group of organic acids compared to the group of antibiotics. **Chen et al (2005)** indicated that Organic acid can stimulate the immune response and increase the resistance of microbial pathogens and is used in broilers diet.

Acidifiers prevent adhesion of pathogenic bacteria to the intestinal mucosa and create an acidic environment in the intestines. Also, **Roser, (2006)** proved that adding organic acids to broiler diets increase immunity response this occurred via stimulation or activation of immune cells by these feed additives.

The value of monocyte percentage varied significantly ($p<0.05$) among different treated group. The highest value was associated with pre. (Dia) group and the lowest value was found for combination (BTF) group. However, no significant differences were observed between (control), pro (Bio), (Pre (Tech.), (Pre (Dia.), and organic acids (FORMI) groups.

Analysis of variance indicated that the feeding treatment did not significantly affect the monocyte percentage between strains.

Liza et al (2016) reported that the highest value of monocyte percentage was found for control group and probiotic treated of Cobb breed (7.40 % and 7.20) and the lowest value was found for organic acid group of Ross breed (1.67).

Regarding organic acid addition, **Mahdavi and Torki (2009)** noted that the dietary inclusion of organic acid did not affect the counts of monocyte, at days 21, 42 and 49 of broilers life.

Concerning value of eosinophils %, **(Table 2)** that no significant between Golden Montaza and Bandara. The highest value was found for organic acids (FORMI) group and the lowest value was found for control group. However, no significant differences were observed between (control), pro (Bio), (Pre (Dia.), and combination (BTF) groups and there were no significant differences observed between pro (Bio), (Pre (Tech.), (Pre (Dia.), and organic acids (FORMI) groups.

Liza et al (2016) reported that eosinophils%, the highest value was found for probiotic treated group of Cobb breed (9.80 %) and the lowest value was found for organic acid treated of Ross breed (1.0%). Eosinophils % was high for probiotic treated group, while for organic acid it was the same as control group **(Khosravi, et al 2010)**.

Regarding the interaction, data confirmed that there was significant interaction effect in heterophils/Lymphocyte ratio, heterophils % andeosinophils % between strain and supplementation of (growth promoters). However, no interaction was observed in Lymphocyte% and monocyte%.

Results in **Table (3)** summarize the effect of supplementations of probiotic (Bio Plus), prebiotic (TechnoMos and Diamond), organic acid (FORMI® NDF) and combination (Bio Plus, TechnoMos and FORMI® NDF) on antibody titer against Newcastle disease virus of females of GoldenMontza and Bandara.

Data show there was no significant difference between Golden Montaza and Bandara forantibody titer against Newcastle disease virus.

Regarding the antibody titer before vaccination the highest values were observed for pre (Tech) group in comparison to pre (Dia) group. However, there were no significant between the control group and all treated groups. Also, the antibody titer against Newcastle vaccine, after vaccination, the highest values were recorded for pre (Tech.), org ((FORMI), combination (Bio, Tech and FORMI) and control groups respectively. However, the lowest values were resulted for pre (Dia) and pro (Bio) groups. There were no significant differences observed between for differences between before and after vaccination against Newcastle disease virus.

These results are in agreement with, **Kazempour and Jahanian (2011)** whom found the antibody titer against Newcastle disease was markedly increased by dietary organic acid supplementation in laying hens. In another study with broiler chickens, **Jahanian, (2011)** reported that the antibody titer against bronchitis and Newcastle disease were not affected by butyric acid treatments but added 0.2% butyric acid glyceride produced an improvement in Newcastle antibody titer at the 12th day after vaccination. Hence, while there is very limited data on the immunological effects of OA, further research is needed to validate the currently published studies and identify the modes of action producing such benefits.

Table 3. Effect of supplementations of probiotic (Bio Plus), prebiotic (TechnoMos and Diamond), organic acid (FORMI® NDF) and combination (Bio Plus, TechnoMos and FORMI® NDF) on antibody titer against Newcastle disease virus of females of GoldeMontza and Bandara

Trait	Strain (S)	Treatment (T)						Overall
		Con.	Bio.	Tech.	Dia.	F.	To.	
BE	GM	7.0±0.58	6±0.58	7.7±0.81	6.7±0.67	9.7±0.67	6.7±0.67	**7.3**^{a}
	B	7.7±0.67	7±1.15	9.0±0.58	5.7±0.81	6.7±0.33	8.7±0.33	**7.4**^{a}
	Overall	**7.3**^{ab}	**6.5**^{b}	**8.3**^{a}	**6.2**^{b}	**8.2**^{a}	**7.7**^{ab}	
AF	GM	11.7±0.33	9.0±0.58	11.3±0.67	10±0.00	11.3±0.67	12.0±0.00	**10.9**^{a}
	B	10.0±0.58	10.3±0.88	12.0±0.00	8.3±0.33	11.7±0.33	10.7±0.33	**10.5**^{a}
	Overall	**10.8**^{a}	**9.7**^{b}	**11.7**^{a}	**9.2**^{b}	**11.50**^{a}	**11.33**^{a}	
DI	GM	4.7±0.88	3.0±0.58	3.7±0.33	3.3±0.67	1.7±0.67	5.3±0.67	**3.6**^{a}
	B	2.3±0.33	3.3±0.33	3.0±0.58	2.7±0.67	5.0±0.00	2.0±0.58	**3.1**^{a}
	Overall	**3.5**^{a}	**3.16**^{a}	**3.33**^{a}	**3.0**^{a}	**3.3**^{a}	**3.7**^{a}	

Prob.	S	T	S*T
BE	NS	0.0254	0.0167
AF	NS	<.0001	0.0114
DI	NS	NS	0.0001

BE: Before vaccination **AF:** After vaccination

DI: Differences between before and after vaccination

Sarica et al (2005) noted that, feed additives are mainly related to the exclusion of competition and prevention of growth and reproduction of pathogens. Consequently, because growth and reproduction of pathogens will increase in the inappropriate the rearing condition such as non-sterile status, high intensity of the birds and emergence of environmental stress, it is believed that positive effects of these feed additives can be detected when broiler are raised in such unsuitable conditions. However, other researcher postulated that organic acids **(Ricke, 2003)** and probiotics **(Patterson and Burkholder, 2003)** improve the immune response. These researchers noted that the stimulation of immune response and increased resistance to the causes of microbial diseases by probiotic and organic acid as they are utilized in broilers diet. **Liza et al (2016)** reported that antibody titer against Newcastle vaccine, at 3rd week after vaccination, the highest values were found for all treated groups (prebiotics, probiotics, synbiotics, organic acids and enzymes) of both Cobb and Ross breed in comparison to control group. **Shahir et al (2014)** indicated that the antibody responses to ND improved by probiotic. **Dehghani and Jahanian (2012)** who found that antibody titers against Newcastle at day 12 post vaccine inoculation was significantly (P<0.01) affected by the addition of organic acid. **Houshmand et al (2012)** who found that antibody titer to Newcastle disease virus was higher in all treated group (probiotic, prebiotic and organic acid) compared to control group. **Amal, et al (2013)** reported that Newcastle disease (ND) vaccination for the Probiotic and Prebiotics supplemented birds was significantly improved in comparison with the vaccinated non treated control group.

Regarding the interaction, data confirmed that there was significant interaction effect in antibody titer to vaccination against Newcastle vaccine between strain and supplementation of (growth promoters). From the previous results, we found that all diet supplementation had appositive effect on antibody titer to vaccination against Newcastle vaccine.

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تقييم الاختلافات الوراثية على الاستجابة المناعية في سلالتين من الدجاج المحلي غذيت على مختلف المكملات الغذائية الطبيعية وحمض عضوى

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الكلمات الدالة: الاستجابه المناعيه، البروبيوتك، البريبيوتك، حمض عضوي، سلالات محليه

الموجـــــــز

الهدف الرئيسي هو دراسة تأثير الاختلافات الجينية في الاستجابة المناعية باستخدام محفزات النمو الطبيعية في الوجبات الغذائية المقدمة لسلالات الدجاج المحلية (المنتزه الذهبى، البندرة). أجريت هذه الدراسة في محطة بحوث سدس للدواجن التابعة لمعهد بحوث الإنتاج الحيواني، محافظة بني سويف، في الفترة من أغسطس إلى يناير (2016) واستخدم عدد 240 دجاجة (120 دجاجة من كل سلالة) من عمر 16 إلي 40 أسبوع. تم توزيع الطيور عشوائيا على ستة معاملات وكان بكل معاملة 20 طائر (اناث) مرباه في اقفاص فردية (20x6x2). المعاملة الأولى من كل سلالة كمجموعة مقارنة. وتم تغذيتها علي نظام غذائي بدون أي إضافات. المعاملة الثانية تم تغذيتها علي عليقة مضاف اليها BioPlus® 2B بمعدل 400 جم/ طن (بروبيوتيك تجاري). أما المعاملة الثالثة تم تغذيتها علي عليقة مضاف اليها TechnoMos® بمعدل 500 جم / طن (بريبيوتيك تجاري) ، المعاملة الرابعة تم تغذيتها علي عليقة مضاف اليها Diamond V® بمعدل 2.5 كجم / طن (بريبيوتيك تجاري). المعاملة الخامسة تم تغذيتها علي عليقة مضاف اليها NDF FORMI® بمعدل 2 كجم/طن (حمض عضوي). المعاملة السادسة تم تغذيتها علي عليقة مضاف اليها مزيج من BioPlus® 2B (400 جم/ طن) + TechnoMos® (500 جم/طن) + NDF FORMI® (2 كجم/ طن).

أظهرت البيانات أن نسبة Heterophils/ Lymphocyte كانت أعلى بشكل معنوي في سلاله المنتزة الذهبي عن البندرة. وجدت أعلى قيمة في معامله الحمض العضوي (FORMI) و أدنى قيمة وجدت في معامله بروبيوتيك (Bio Plus).

ووجد ان تتر الأجسام المضادة قبل التطعيم أعلى في المجموعة البريبيوتك (Tech) بالمقارنة مع مجموعة البريبيوتك (Dia). ولم يكن هناك معنوية بين المجموعة المقارنة وجميع المجموعات المعاملة. بالاضافة الي ان أعلى قيم لتتر الأجسام المضادة ضد لقاح نيوكاسل بعد التطعيم، وجدت في مجموعات (Tech)، الحمض العضوي (FORMI) والمزيج بين (Bio, Tech and FORMI) ومجموعة الكنترول مقارنة بالمجموعات (Dia) و (Bio). و لم توجد فروق معنوية في قيم التتر لفيروس النيوكاسل قبل وبعد التطعيم.

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