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EFFECT OF DIETARY SUPPLEMENTATION WITH MANNAN-OLIGOSACCHARIDES, AND *Enterococcus faecium* AS WELL AS THEIR COMBINATION ON GROWTH PERFORMANCE AND CARCASS TRAITS OF BROILER CHICKENS

Mohamed A. Habib*, M.M. El-Hindawy, A.I. Attia and M.S. El-Kholy

Poult. Dept., Fac. Agric., Zagazig Univ., Egypt

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ABSTRACT: A 3×3 factorial experiment was performed to study the effect of supplementing broiler diets with different levels of Mannan-oligosaccharides (MOS) (0, 4 and 8 g/kg diet), *Enterococcus faecium* (*E.f*) (0, 1×10^9 and 2×10^9 CFU/kg diet) and their combination on growth performance and carcass traits of broiler chickens. A total number of 360 1-week-old broilers were randomly distributed to 9 equal groups, each group contained 40 unsexed birds with 4 replications (10 birds each). Results showed that average live body weight (LBW), body weight gain (BWG) and feed conversion ratio (FCR) of broiler chicks received diets containing 4 and 8 g MOS/kg were better than control group. While feed intake (FI) was not significantly affected by different levels of dietary MOS. The addition of 1×10^9 CFU of *E.f* to the basal diet of broiler chicks insignificantly enhanced the increase of LBW, BWG and FCR, while the addition of 2×10^9 CFU of *E.f* significantly increased LBW, BWG and FCR, as compared to control. No significant differences were found between groups treated with tested probiotic in LBW, BWG and FCR. The amount of feed consumed through the experiment was not significantly affected with *E.f* supplementation at different levels. No significant effects were detected due to dietary treatment with MOS, *E.f* or their interaction on all studied carcass traits (carcass, liver, gizzard, heart, total giblets and dressing percentages). The results indicated that supplementing broiler diets with different levels of MOS, *E.f* and their combination has positive effect on growth performance with no significant effect on carcass traits.

Key words: Mannan-oligosaccharides, *Enterococcus faecium*, broiler, performance carcass.

INTRODUCTION

Broilers are often exposed to multiple challenges during poultry production practices. These challenges include inadequate housing conditions, dietary toxins, pathogen infection, and high growth rate. Additional issues can often occur as a result of increased frequency of administration of antibiotics **(Gomes *et al.*, 2014)**. Antibiotics are used in the poultry diet for three purposes: preventing the disease outbreak, treating sick animals, and improving their growth performance **(Kamphues and Hebeler, 1999)**. Administration of antibiotics at the early stages of a chick's life can severely disrupt intestinal microbiota composition, resulting in a delay in immune system development and compromised immune function **(Simon *et al.*, 2016)**. The unreasonable use of antibiotics develops the resistance of bacteria to antibiotics, which are a potential risk if they are transferred to humans **(Stanton, 2013).** For this reason, the use of antibiotics has been banned by the European Union. The use of antibiotics has been minimized and replaced by effective dietary supplements such as probiotics and/or prebiotics that are claimed to enhance growth and positively modulate the immune system. It has previously been reported that the early presence of beneficial microorganisms in

* **Corresponding author: Tel. :** +201068991449
E-mail address: mohamedhabibegy@gmail.com

the gastrointestinal tract (GIT) of broiler chicks facilitates resistance against pathogens by improving the health and integrity of the GIT. These microorganisms also help to improve both immune system function and growth **(Cox and Dalloul, 2015)**.

Prebiotics are feed supplements that beneficially affect the host by selectively stimulating the growth or activity of the limited number of bacterial species inhabiting the digestive tract, without being digested **(Patterson and Burkholder, 2003)**. Mannan-oligosaccharide (MOS) is a prebiotic derived from cell wall of *Saccharomyces cerevisiae.* This indigestible sugar is involved in a wide variety of functions including reduction in pathogenic bacteria **(Spring *et al.*, 2000)**, enhancing beneficial bacteria **(Baurhoo *et al.*, 2007)**, increasing villus height and decreasing crypt depth **(Yang *et al.*, 2009)**, modulating immune response **(Khalaji *et al.*, 2011)**, and improving performance of broilers **(Rosen, 2007)**.

Probiotics are live, non-pathogenic microorganisms that benefit host health and physiology by stabilizing the intestinal ecosystem. *Enterococcus faecium* (*E.f*) is one of the first probiotic species approved by the EU and the FDA for animal feed **(Franz *et al.*, 2011)**. Results from poultry experiments have revealed that supplementation of the diet with *Enterococcus faecium* improves growth performance and modulates intestinal microflora composition **(Luo *et al.*, 2013)**. *Enterococcus faecium* has also been shown to alter antioxidant status by exerting antioxidant properties **(Luo *et al.*, 2013)**, and changing blood biochemical parameters **(Capcarova *et al.*, 2010).** However, very little information exists in relation to the impact of *E. faecium* with or without MOS on growth performance and carcass traits in broiler chickens. Therefore, the aim of this study was to determine the effect of different dietary levels of MOS and/or *E.f* on growth performance, and carcass traits of broiler chickens.

MATERIALS AND METHODS

The present study was carried out in a private poultry farm, Sharkia Governorate, Egypt. A total number of 360 one week old broilers were randomly distributed to 9 equal groups in a 3×3 factorial experiment including 3 levels of MOS (0, 4 and 8 g/kg diet) and three levels of *E.f* (0, 1×10^9 and 2×10^9 CFU/kg diet). Each group contained 40 unsexed birds with 4 replications (10 birds each). Chicks were placed in separated pen (100×100 cm). Birds in all treatment groups were fed on the same basal diets (Table 1) which formulated to meet broiler requirements during starter and finisher phases according to **NRC (1994)**.

All birds were reared in controlled environmental conditions (Fan and Pad Evaporative Cooling Systems) under continuous light program. The indoor temperature was around 30 °C through the second week, after that the temperature was gradually reduced to 24 °C until the end of the experiment. The standard management and husbandry procedure was applied during the experimental period. Feed and water were introduced *ad libitum* through the experimental period.

Data Collection

Growth performance

Chicks were weighted (g) at 1st and 5th week of age and body weight gain (g/day) was calculated as the difference between the two weights. Feed intake (g/bird/day) was estimated by subtracting the residual feed from the offered feed. Feed conversion ratio (g feed/g weight gain) was calculated as the ratio of feed intake (g) to body weight gain (g).

Carcass traits

At 5th week of age, four birds from each treatment were randomly selected, weighted, and slaughtered by the Islamic method. Whole eviscerated carcass, gizzard, liver and heart were individually weighted in gram, and total giblets weight (liver + heart + gizzard) and dressing weight (carcass + total giblets) were calculated. All weights were represented as a percent of live body weight.

Statistical Analysis

Data were statistically analyzed on 3 × 3 factorial design basis according to **Snedecor and Cochran (1982)** using the General Linear Model function of the SPSS 11.5 for Windows **(SPSS, 2008)**. Differences among means within the same factor were tested using Duncan's New Multiple Rang test **(Duncan, 1955).**

Table 1. Composition and nutrient content of the basal diet

Item	Starter (1-3 weeks)	Finisher (3-5 weeks)
Ingredient (%)		
Maize 8.5%	53.03	59.21
Soybean meal 44%	35.00	27.00
Maize gluten meal 62%	5.00	5.00
Soybean oil	2.90	4.82
Limestone	1.40	1.37
Di-calcium phosphate	1.50	1.55
Salt	0.30	0.30
Premix[1]	0.30	0.30
L-Lysine	0.15	0.15
Dl-Methionine	0.12	-
Choline chloride (50%)	0.30	0.30
Total	100	100
Calculated composition[2] (%)		
ME, Kcal /Kg	3000	3200
Crude protein	23.01	20.01
Calcium	1.02	1.00
Nonphytate P	0.45	0.45
Lysine	1.32	1.10
TSAA[3]	0.92	0.72

[1]Provides per kg of diet: Vitamin A, 12,000 I.U; Vitamin D3, 5000 I.U; Vitamin E, 130.0 mg; Vitamin K3, 3.605 mg; Vitamin B1 (thiamin), 3.0 mg; Vitamin B2 (riboflavin), 8.0 mg; Vitamin B6, 4.950 mg; Vitamin B12, 17.0 mg; Niacin, 60.0 mg; D-Biotin, 200.0 mg; Calcium D-pantothenate, 18.333 mg; Folic acid, 2.083 mg; manganese, 100.0 mg; iron, 80.0 mg; zinc, 80.0 mg; copper, 8.0 mg; iodine, 2.0 mg; cobalt, 500.0 mg; and selenium, 150.0 mg.

[2]Calculated according to **NRC (1994).**

[3]Total sulfur amino acids

RESULTS AND DISCUSSION

Growth Performance Traits

Effect of mannan-oligosaccharides supplementation

The mean values of LBW, BWG, FI and FCR of broiler chicks as affected by different levels of dietary MOS and *E.f* are summarized in Table 2. It could be noticed that average LBW and BWG of broiler chicks received diets containing 4 and 8 g MOS/kg were greater (P = 0.007) than control group. On the other hand FI was not significantly (p>0.05) affected by different levels dietary MOS. Regarding to feed conversion ratio, the addition of MOS with both levels to the basal diet of broiler chicks significantly (p=0.008) improved the FCR during 1-5 weeks of age. There were no significant differences in feed conversion between chicks fed different levels of tested prebiotic (4 and 8 g MOS/kg diet).

These effects may attributed to the role of prebiotic (MOS) in reducing the load of intestinal pathogenic bacteria and stimulating the beneficial ones, which leading to healthy

Table 2. Effect of dietary supplementation with different levels of mannan-oligosaccharides (MOS) and *Enterococcus faecium* (*E.f*) and their interactions on live body weight, body weight gain, feed intake and feed conversion of broiler chicks from 1-5 weeks of age

		LBW 1 wk	LBW 5 wk	BWG 1-5 wk	FI 1-5 wk	FCR 1-5 wk
MOS (g/kg diet)						
0		188.4 ± 0.961	1989 ± 31.52^{b}	64.31 ± 1.132^{b}	117.9 ± 1.922	1.840 ± 0.054^{a}
4		189.1 ± 1.010	2120 ± 30.49^{a}	68.95 ± 1.095^{a}	110.8 ± 3.158	1.614 ± 0.068^{b}
8		187.7 ± 1.877	2065 ± 48.50^{a}	67.04 ± 1.731^{a}	113.1 ± 2.013	1.701 ± 0.065^{b}
p-value		0.825	0.007	0.007	0.062	0.008
***E.f* (CFU/kg diet)**						
0		188.6 ± 0.928	1984 ± 19.89^{b}	64.11 ± 0.708^{b}	117.4 ± 1.926	1.833 ± 0.039^{a}
1 × 10^{9}		188.3 ± 1.460	2059 ± 45.31^{ab}	66.80 ± 1.616^{ab}	113.5 ± 2.752	1.716 ± 0.083^{ab}
2 × 10^{9}		188.3 ± 1.606	2131 ± 39.24^{a}	69.40 ± 1.406^{a}	110.9 ± 2.659	1.607 ± 0.059^{b}
p-value		0.984	0.003	0.003	0.100	0.008
MOS × *E.f*						
0	**0**	188.5 ± 2.548	2000 ± 48.88^{c}	64.70 ± 1.758^{c}	117.0 ± 2.244^{ab}	1.813 ± 0.084^{a}
	1 × 10^{9}	187.9 ± 1.967	1956 ± 86.15^{c}	63.14 ± 3.113^{c}	118.6 ± 4.438^{ab}	1.893 ± 0.158^{a}
	2 × 10^{9}	188.7 ± 0.733	2011 ± 35.41^{bc}	65.09 ± 1.242^{bc}	118.1 ± 4.353^{ab}	1.813 ± 0.033^{a}
4	**0**	189.9 ± 1.337	2011 ± 9.820^{bc}	65.05 ± 0.324^{bc}	120.8 ± 2.793^{a}	1.857 ± 0.038^{a}
	1 × 10^{9}	189.1 ± 3.018	2201 ± 29.09^{a}	71.85 ± 1.026^{a}	104.3 ± 2.846^{c}	1.453 ± 0.052^{b}
	2 × 10^{9}	188.3 ± 0.817	2147 ± 25.98^{ab}	69.96 ± 0.952^{ab}	107.3 ± 5.105^{bc}	1.533 ± 0.075^{b}
8	**0**	187.5 ± 0.736	1940 ± 28.01^{c}	62.58 ± 1.021^{c}	114.3 ± 4.563^{abc}	1.830 ± 0.098^{a}
	1 × 10^{9}	187.9 ± 3.477	2019 ± 14.27^{bc}	65.41 ± 0.420^{bc}	117.5 ± 0.030^{ab}	1.800 ± 0.012^{a}
	2 × 10^{9}	187.9 ± 5.440	2236 ± 61.29^{a}	73.14 ± 2.206^{a}	107.5 ± 1.247^{bc}	1.473 ± 0.045^{b}
p-value		0.994	0.011	0.011	0.044	0.018

Means in the same column within each classification bearing different letters are significantly different ($P \leq 0.05$).
LBW= live body weight; BWG= body weight gain; FI= feed intake; FCR= feed conversion ratio.

environment in intestine and resulting in increased appetite and intestinal digestion and absorption of nutrients in the intestine **(Hasan *et al.*, 2014; Chacher *et al.*, 2017)**. Also, MOS supplementation increased intestinal production for short chain fatty acids, like butyric and propionic acid **(Yang *et al.*, 2007)**. Furthermore, MOS supplementation decreased the pH in the intestine through stimulating the production of butyric, propionic and lactic acid from the Lactobacillus spp. **(Iji and Tivey, 1999)**. Corresponding decrease in pH of butyric acid play an important role in growth promotion **(Ahsan *et al.*, 2016)**. Moreover, **Iji *et al.* (2001)** demonstrated that the improvement in growth performance were associated with the better digestion and digestive enzyme activity includes maltase, alkaline phosphatase and leucine aminopeptidase, which increased in the existence of MOS.

The present results agree with **Kumprecht and Zobac (1997)** who used 0.2% MOS in finisher diet of broilers and recorded higher body weight than those recorded in control group. **Hooge *et al.* (2003)** found that MOS supplementation at levels of 0.1 and 0.05%, in the starter and finisher diets, respectively, improved LBW of broiler chicks in comparable to un-supplemented group. **Blake *et al.* (2006)** fed broilers on diets supplemented with MOS at level 0.2, 0.15 and 0.05% during starter, grower and withdrawal periods, respectively, and recorded a significant increase in body weight on day 14 of trial. **Benites *et al.* (2008)** reported that birds fed diet supplemented with MOS (0.1, 0.05 and 0.05% of starter, grower, finisher diet, respectively) had significantly higher body weight on day 42 of the trial than birds fed the basal diet. **Hooge (2004)** reported that dietary MOS addition produced higher weight gain compared to broilers fed on control diet. **Denev *et al.* (2006)** showed that MOS produced significantly higher body weight gain and improved FCR than control diets when added in feed (0.2% from 0-21 d and 0.1% from 21-42 d). **Shendare *et al.* (2008)** assessed the effect of 0.1% MOS on weight gain and FCR of broiler chicks and concluded that addition of MOS significantly improved weight gain and FCR compared with control, while feed intake was not affected significantly. **Zikic *et al.* (2011)** stated that dietary administration with MOS (0.1, 0.075 and 0.05% in starter, grower and finisher diet, respectively) led to superior weight gain ($P<0.05$) and FCR ($P>0.05$) in broilers when compared to un-administrated group.

Effect of *Enterococcus faecium* (*E.f*) supplementation

Results in Table 2 reveal that the addition of 1×10^9 CFU of *E.f* to the basal diet of broiler chicks insignificantly enhanced the increase of LBW and BWG, while the addition of 2×10^9 CFU of *E.f* significantly (p=0.003) increased LBW and BWG, as compared to control. There were no significant differences between groups treated with tested probiotic in LBW and BWG. The amount of feed consumed through the experiment was not significantly ($p>0.05$) affected due to different levels of *E.f* supplementation. Regarding to FCR, high level of *E.f* (2×10^9 CFU/kg) supplementation improved significantly FCR when compared to control group. However, dietary *E.f* supplementation at 1×10^9 CFU/kg showed no significant effect on feed conversion when compared with control group and *E.f* supplemented group at 2×10^9 CFU/kg. These beneficial effects of *E.f* on growth performance may be due to its effect in stimulating growth of beneficial bacteria which improved absorption of nutrients and depressed harmful bacteria by competitive exclusion, as well as, helped in maintaining optimum pH of the intestinal tract needed to inhibit undesirable bacteria that causes growth depression**. Wu *et al.* (2018)** demonstrated that the improvement in average daily gain of broiler chicks by *E.f* supplementation was possibly attributed to the increase in lactic acid bacteria count or alterative of intestinal mucosal structure thereby enhancing absorption of nutrients. The results obtained by **Taklimi *et al.* (2010)** showed that probiotic had significantly positive effect on morphology of small intestine (villi height and length, and crypt depth), suppressing ammonia production and urea activity which can be beneficial for improving animal health and enhancing growth as ammonia can cause damage to the surface of cell.

In agreement with the present results, **Wu *et al.* (2018)** found that BWG and feed conversion ratio were significantly improved with dietary *E.f* administration at 5×10^7 CFU /kg diet from 22 to 35 day of age. **Shewita *et al.* (2016)** recorded the highest body gain and feed intake in broilers received diet supplemented with 0.75 g protexin (*E.f*) /kg diet, in comparable to control group. **Cao *et al.* (2013)** found that broiler chicken fed diet supplied with *E.f* (1×10^9 CFU /kg diet) had significant the greatest LBW on 10, 14, 21 and 28 days of age, and highest BWG during 10-14, 15-21 and 10-28 days of age. **Capcarova *et al.* (2010)** concluded that addition of *E.f* in the diet of broiler chicks resulted in slight increase in LBW and feed conversion ratio. **Samli *et al.* (2007)** observed that supplementation of *E.f* positively affected BWG.

On the other hand, other researchers showed no significant promotion of *E.f* in relation to growth performance in non-infected birds **(Luo *et al.*, 2013)**. **Midilli *et al.* (2008)** observed no significant effect in body weight and body weight gain and feed conversion ratio with dietary probiotic supplementation as compared with other diets. Also, **Luo *et al.* (2013)** observed that supplementing the basal diet with different levels of *Enterococcus faecium* had no significant positive or negative effect on broiler body weight during the experimental growth phases. This inconsistent results might be attributed to differences in probiotics strain properties, inclusion dosage and timing, composition of feed and health status of birds **(Wu *et al.*, 2018)**.

Interaction effect (MOS × *E.f*)

Table 2 summarize the interaction effect of MOS and *E.f* supplementation on LBW, BWG, FI and FCR from 1-5 weeks of age. From these results, the impact of the interaction was significant on LBW (P=0.011), BWG (P=0.011), FI (P=0.044) and FCR (P=0.018). Birds fed diets supplemented with 8 g MOS + 2×10^9 *E.f* and 4 g MOS + 1×10^9 exhibited the highest value of LBW at 5 weeks of age and BWG through 1-5 weeks of age. It could be noticed that, within any MOS level (4 or 8 g/kg diet), *E.f* supplementation increased LBW and BWG when compared with groups fed diets without *E.f*. The highest amount of FI (120.8 g/bird/day) was recorded for chicks received diet supplemented with 4 g MOS/kg diet, while the lowest amount was recorded for chicks fed diet supplied with 4 g MOS/kg diet plus 1×10^9 CFU *E.f* /kg diet. Regarding to FCR, the results demonstrated that the best overall mean values of FCR were detected for chicks received diets contained 4 g MOS plus any level of *E.f* and for those received diet contained 8 g MOS plus 2×109 *E.f*. In agreement with these results, other researchers reported that feeding a mixture of probiotics or synbiotic containing *E.f* elicited beneficial effects on LBW, BWG and FCR in broilers chicks **(Wu *et al.*, 2018)**.

Carcass traits

Results in Table 3 show no significant effect due to dietary treatment with MOS, *E.f* or their interaction on all carcass traits (carcass, liver, gizzard, heart, total giblets and dressing percentages). These results are in agree with those obtained by **Falaki, *et al.* (2010)** who found no significant effect of probiotic, prebiotic or their combination treatment on carcass traits of broiler chicks. Also, **Sarangi *et al.* (2016)** reported that dietary supplementation of prebiotic and/or probiotic had no significant effects on carcass traits (dressing, carcass, heart, liver and gizzard percentages) of broiler chicks. **Shah *et al.* (2019)** found that dietary supplementaion with MOS had no significant effect on dressing, carcass, heart, liver and gizzard percentages of broiler chicks. With regard to the effect of dietary *E.f* supplementation on carcass traits, our results agree with **Weis *et al.* (2011)** who found no significant differences between control group (received water without any additives) and experimental group (received a *E.f* in drinking water with concentration of 2×10^9) on carcass yield of Ross broiler chicks. **Rutz *et al.*, (2004)** noted numerically higher carcass yield for birds fed diet containing probiotic (Nu Pro®) but the differences were not statistically significant. **Abaza *et al.* (2008)** reported that, the probiotic treatments had no significant effect on dressing and giblets percentages as compared with control. **Wang *et al.* (2009)** stated that dressing percentage or yield of various carcass component, expressed either as total weight or as percentage of carcass weight were not significantly differed among the various treatments Nu Pro® a yeast product rich in nucleotides. **Abo Hafsa (2012)** noted that dietary probiotic (*Bacillus subtillis*-isolate BS14) had no significant effect on most carcass traits of broiler chicks. **Rabie *et al.* (2010)** found that carcass traits of broiler chicks were not affected due to adding graded levels of probiotic (Avian plus) in plant protein diets. In contrast, **Chen (2009)** observed that *Bacillus subtilis* decreased relative liver weight ($p<0.05$) and increased the relative weight of gizzard ($p<0.05$) of broiler at 42 days of age.

Conclusion

From the results of this study it could be concluded that supplementing broiler diets with different levels of MOS (4 and 8 g/kg diet), *E.f.* (1×10^9 and 2×10^9 CFU/kg diet) and their combination has positive effect on growth performance with no significant effect on carcass traits.

Table 3. Effect of dietary supplementation with different levels of mannan-oligosaccharides (MOS) and *Enterococcus faecium* (*E.f*) and their interactions on carcass traits of broiler chicks at 5th week of age

Item		Carcass (%)	Liver (%)	Gizzard (%)	Heart (%)	Total giblets (%)	Dressing (%)
MOS (g / kg diet)							
0		73.11 ± 0.503	2.133 ± 0.113	1.432 ± 0.043	0.390 ± 0.018	3.957 ± 0.129	77.07 ± 0.523
4		72.06 ± 0.369	2.304 ± 0.089	1.417 ± 0.050	0.442 ± 0.035	4.164 ± 0.080	76.22 ± 0.358
8		72.38 ± 0.342	2.179 ± 0.076	1.437 ± 0.053	0.390 ± 0.019	4.002 ± 0.113	76.39 ± 0.347
p-value		0.178	0.517	0.961	0.260	0.456	0.309
***E.f* (CFU/kg diet)**							
0		72.82 ± 0.524	2.176 ± 0.078	1.398 ± 0.060	0.397 ± 0.018	3.971 ± 0.106	76.79 ± 0.516
1×10^9		72.56 ± 0.411	2.234 ± 0.096	1.458 ± 0.042	0.407 ± 0.028	4.097 ± 0.089	76.65 ± 0.374
2×10^9		72.17 ± 0.329	2.207 ± 0.113	1.430 ± 0.039	0.419 ± 0.031	4.056 ± 0.136	76.23 ± 0.380
p-value		0.506	0.928	0.724	0.822	0.758	0.591
MOS × *E.f*							
0	**0**	74.32 ± 0.743	2.120 ± 0.212	1.480 ± 0.065	0.380 ± 0.026	3.980 ± 0.272	78.30 ± 0.759
	1×10^9	72.66 ± 0.803	2.137 ± 0.238	1.447 ± 0.111	0.420 ± 0.046	4.003 ± 0.264	76.66 ± 0.639
	2×10^9	72.34 ± 0.844	2.143 ± 0.226	1.370 ± 0.045	0.370 ± 0.021	3.887 ± 0.226	76.23 ± 1.054
4	**0**	72.57 ± 0.551	2.233 ± 0.118	1.340 ± 0.100	0.380 ± 0.032	3.960 ± 0.053	76.52 ± 0.570
	1×10^9	71.83 ± 0.854	2.350 ± 0.199	1.477 ± 0.088	0.443 ± 0.072	4.270 ± 0.045	76.10 ± 0.899
	2×10^9	71.78 ± 0.633	2.330 ± 0.191	1.433 ± 0.087	0.503 ± 0.067	4.263 ± 0.203	76.04 ± 0.578
8	**0**	71.58 ± 0.710	2.173 ± 0.101	1.373 ± 0.152	0.430 ± 0.036	3.973 ± 0.242	75.55 ± 0.591
	1×10^9	73.18 ± 0.433	2.217 ± 0.048	1.450 ± 0.035	0.357 ± 0.009	4.017 ± 0.034	77.20 ± 0.400
	2×10^9	72.39 ± 0.258	2.147 ± 0.234	1.487 ± 0.075	0.383 ± 0.038	4.017 ± 0.303	76.41 ± 0.501
p-value		0.171	0.997	0.717	0.253	0.894	0.183

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تأثير الإضافة الغذائية من سكر المنان وبكتريا المكورات المعوية البرازية والخليط بينهما على أداء النمو وصفات الذبيحة لدجاج التسمين

محمد أحمد حبيب - محمد محمد الهنداوي - عادل إبراهيم عطية- محمد سليمان الخولي

قسم الدواجن – كلية الزراعة – جامعة الزقازيق – مصر

تم إجراء تجربة عاملية ٣×٣ لدراسة تأثير الإضافة الغذائية من سكر المنان (بمستوى صفر، ٤ ، ٨ جم/ كجم عليقة) وبكتريا المكورات المعوية البرازية (بمستوى صفر، ١×١٠^{٩} ، ٢×١٠^{٩}/كجم عليقة) والخليط بينهما على أداء النمو وصفات الذبيحة لدجاج التسمين ، ولهذا الغرض تم توزيع عدد ٣٦٠ كتكوتًا عمر أسبوع إلى ٩ مجموعات تجريبية متساوية ، احتوت كل منها على عدد ٤٠ كتكوتًا غير مجنس قسمت على أربع مكررات بكل منها عدد ١٠ كتاكيت ، وقد أوضحت النتائج المتحصل عليها أن وزن الجسم الحي ووزن الجسم المكتسب ومعدل التحويل الغذائي للكتاكيت التي تغذت على علائق بها سكر المنان بمستويات ٤ و ٨ جم/كجم عليقة كانت أفضل منها في المجمة الضابطة، بينما لم يتأثر الغذاء المأكول تأثرا معنويا بإضافة سكر المنان بمستوياته المختلفة، كما أدت إضافة البكتريا بمستوى ١×١٠^{٩}/كجم عليقة إلى تحسن غير معنوي في الوزن الحي ووزن الجسم المكتسب ومعدل التحويل الغذائي بينما أدت إضافة البكتريا بمستوى ٢×١٠^{٩}/كجم عليقة إلى تحسن معنوي في وزن الجسم الحي ووزن الجسم المكتسب ومعدل التحويل الغذائي ، ولم يلاحظ وجود فروق معنوية بين المجاميع المغذاة على البكتريا بمستوييها على هذه الصفات، ولم تتأثر كمية العلف المستهلكة بالمعاملة بالبكتريا بمستوياتها المختلفة، ولم يلاحظ وجود تأثيرات معنوية للمعاملة بسكر المنان أو للمعاملة بالبكتريا أو للخليط بينهما على أي من صفات الذبيحة التي تم دراستها (الوزن النسبي للذبيحة والكبد والقانصة والقلب والأحشاء المأكولة ونسبة التصافي)، تدل هذه النتائج على تحسن أداء النمو لدجاج التسمين بالإضافة الغذائية من سكر المنان أو بكتريا المكورات المعوية البرازية أو الخليط بينهما، بينما لم تتأثر صفات الذبيحة معنويا بهذه الإضافات.

المحكمـــــون:

١- د. صبـــري عبدالجـواد السـيد أستاذ التغذية المساعد – كلية الطب البيطري – جامعة الزقازيق.

٢- د. محمود محمد إبراهيم العجواني أستاذ الدواجن المساعد – كلية الزراعة – جامعة الزقازيق.