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Influence of Probiotic (Miaclost) Supplementation on Carcass Yield, Chemical Composition and Meat Quality of Broiler Chick

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ABSTRACT

The Aim of this study was study the influence of probiotic (MiaClost) supplementation on carcass yield, chemical composition and meat quality of broiler chick. The experiment applied on one week old chicks to the following treatments: Control: (control treatment: 0.00 MiaClost /liter of drinking water), T2: (adding 0.160 gm. MiaClost /liter of drinking water), T3: (adding 0.175 gm. MiaClost /liter of drinking water), T4: (adding 0.190 gm. MiaClost /liter of drinking water). After 42 day of experimental period, the parameters results were, results of live body weight, carcass weight traits showed in significant ($p<0.01$) differences among treatments, results of chemical composition, showed that supplement of probiotic lead to significant ($p<0.01$) decrease moisture percentages in breast and thigh meat, significant ($p<0.01$) increase protein percentages in breast and thigh meat, while in significant ($p<0.01$) effect in Fat and Ash of two type of meat. For physical traits, the probiotic supplementation not effect on pH of Breast and thigh meat, while lead to significant ($p<0.01$) increase in water holding capacity percentages in breast and thigh from 2nd treatment and decrease in 3rd treatment group, cooking loss affect significantly ($p<0.01$) by using probiotic, that breast and thigh meat in 3rd treatment has higher percentages, while the lowest percentages recorded in breast and thigh meat of 2nd treatment.

Keywords: Probiotic (MiaClost), carcass yield, chemical composition, meat quality.

INTRODUCTION

Using of antibiotic lead to residue in poultry meat and eggs may have harm effects on human consumers, and this residues lead to generating flora and pathogenic microbes resistant to antibiotics. Edens (2003) mentioned that with growing attention about antibiotic resistance, and the block on adequate antibiotic usage in Europe and the potential for aprevent in the United States, there is rising concern in finding alternatives to antibiotics for poultry production. The so called probiotics can be listed among these products (Patterson and Burkholder, 2003). According to the Food and Agriculture Organization (FAO) (2002) and the World Health Organization (WHO), probiotics are live microorganisms strains of that give health benefits upon the consumer when used in adequate amounts. For example, Santin et al.(2001) probiotic implementation has been recorded in the poultry industry with an assurance on their impact on the performance of chickens and their meat chemical compositions. modern studies expose that probiotics complement in feed of poultry positive effect on meat pH, colour, water-holding capacity, fatty acid profile and oxidative stability (Saleh, 2014). We hypothesized that probiotics isolated from the intestines of free-range chickens can improve meat composition and promote animal health by modulating gut microbiota. So the aims of this study will Influence of probiotic (MiaClost) supplementation on carcass yield, chemical composition and meat quality of broiler chick

MATERIALS AND METHODS

Distributing randomly (264) un-sexed (one day old) to four treatments, in three replicates containing twenty two birds each. The experiment will have applied on one week old chicks to the following treatments:

Control: (control treatment: 0.00 MiaClost /liter of drinking water),
T2: (Adding 0.160g MiaClost /liter of drinking water),
T3: (Adding 0.175g MiaClost /liter of drinking water),
T4: (Adding 0.190 g MiaClost /liter of drinking water).

The chicks will rearing using three different levels of diets as follows: Starter during the age of 1-11 days including 23% crude protein and 2900 Kcal/kg, Grower during the age of 12-25 days including 21.5% crude protein and 3000 Kcal/kg, and Finisher during the age of 26-42 days including 20% crude protein and 3175 Kcal/kg.

Parameters:

The following parameters recorded in the end of experimental period:

- Live weight.
- Carcasses yield
- Chemical composition (Breast and thigh meat)
- Water Holding capacity (Breast and thigh meat)
- pH ((Breast and thigh meat)
- Cooking loss (Breast and thigh meat)

For each treatment, 12 birds were used to calculate the carcass yield, breasts, drumsticks, thighs, and wings. The chickens were slay by splite of the jugular vein, and after bleeding and eviscerated and their carcasses were weighed with the aid of a digital balance.

Chemical composition:

Moisture content:

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Moisture content must determine as weight loss after the samples were dried in a convection oven at 105˚C for 16 hr (Kelrich. 1990).

Protein content:

Protein content was determined according to the method of Kelrich (1990) by using micro Kjeldahl and was calculated as follows:

Protein %= Nitrogen ×6.25

Fat contents

The percentage of fat in fish meat samples was estimated by taking a known weight of dried samples and extracted with diethyl ether using the Soxhlet apparatus. The amount of fat was calculated based on the method described in Kelrich (1990).

Ash content:

Ash content was determined according to the method of Kelrich (1990) by taking a known weight of flesh and placing it in a muffle furnace at 550 ºC for 16 hrs. The ash percent was determined as follows:

Ash %=W_1/W_2 ×100

Where W1 = weight of ash, and W2 = initial weight

Physic-chemical traits:

pH:

pH of muscle sample measure according to the method described by Ibrahim *et al.*, (2010). Muscle samples (10gm) homogenize with 100 ml distilled water for 1 min, the pH then measure by a pH meter.

Cooking loss:

Cooking loss determine according to Murphy and Zerby (2004). Muscle samples (20gm) place in an open aluminum boxes and cook for 8.5 min in oven pre-heated to 176˚C to an internal temperature of 70˚C. After cooking, the samples must dry with a paper towel. Each sample cool for 30 min, cooking weight measure. The cooking loss calculates by the following formula:

$$\text{Cooking loss \%} = \frac{\text{Raw sample weight – cooked sample weight}}{\text{Raw sample weight (gm)}} \times 100$$

Water holding capacity (WHC):

Water holding capacity (WHC) determine according to Wardlaw *et al.*, (1973). 20gm of minced muscle sample place in centrifuge tube containing 30ml of 0.6M NaCl and stirre with glass rod for 1 min.

The tube keeps at refrigeration temperature (4˚C) for 15 min, stirre again and centrifuge at 2806.1 xg (4˚C) for 15 min. The supernatant measure and amount of water retain by samples and express in percentage. The WHC report as ml of 0.6 M NaCl per 100g of muscle according to the following formula:

$$\text{WHC \%} = \frac{\text{Initial solution weight - final solution weight}}{\text{sample weight (gm)}} \times 100$$

Statistical Analysis:

All data will statistically analyzing by the Completely Randomized Design (CRD) by the SAS (Allison, 2010) system and the differences between the means of groups will separating by Duncan Multiple Range Test (Duncan, 1955) statements of statistical significance are basing on (P≤ 0.01).

RESULTS AND DISCUSSION

The results in table 1 showed that live weight of broiler chicks fed on feed supplemented with probiotic (MiaClost) not differ significantly ((P≤ 0.01) with weight of chick from control groups. The results of carcass weight, Breast weight, Thigh weight, Back weight, Neck weight, Wing weight, Wing weight, Heart weight, Gizzard weight, Liver weight and Spleen weight in broiler chicks recorded that no significant (P≤ 0.01) different among treatments. Other authors found same our results, that using probiotic not effect on carcass yield (Pelicano et al., 2003; Vargas Jr. et al., 2002). Also Midilli et al. (2008) did not record any significant effect of probiotic and Mannan-oligosaccharides on carcass yield and internal organ relative weight in broiler chicks. Same results found by Racevi Stupelien V, (2007), observed non-significant differ in non-carcass component weights between control and treated group except for liver.

Table 1. Effect of Probiotic (MiaClost) on live weight, carcass weight and traits of broiler chick

Traits	Treatments			
	Control	T1	T2	T3
live weight	2.59 ± 0.06a	2.59 ± 0.10a	2.57 ±0.09a	2.72 ± 0.15a
Carcass weight	1.79 ± 0.04a	1.87 ± 0.07a	1.84 ± 0.06a	1.94 ± 0.10a
Breast weight	578.50 ±27.44a	646.00 ± 28.74a	620.00 a ± 30.91	668.00 a ± 40.80
Thigh weight	495.33 ± 3.71a	501.33 ± 21.61a	517.66 ± 24.50a	522.66 ± 24.39a
Back weight	237.83 ± 11.52a	217.00 ± 11.61a	215.16 ± 15.63a	246.16 ± 24.19a
Neck weight	240.83 ± 14.80a	243.00 ± 21.03a	233.83 ±8.93a	239.66 ± 15.54a
Wing weight	200.00 ±7.94a	205.00 ± 17.50a	192.83 ± 6.03a	195.16 ± 11.47a
Heart weight	10.71 ± 7.94a	11.07 ± 0.74a	10.447 ± 0.67a	11.66 ± 0.67a
Gizzard weight	28.87 ± 1.08a	28.04 ± 1.12a	28.67 ± 2.32a	24.52 ± 0.63a
Liver weight	61.72 ± 4.92a	60.43 ± 4.32a	66.34 ± 5.63a	67.59 ± 2.45a
Spleen weight	2.793 ±0.13a	3.58 ± 0.77a	3.78 ± 0.32a	3.14 ± 0.37a

The different letter in same row means significantly differ (P ≤0.01).

The results of table (2 and 3) showed that moisture percentages in breast and thigh meat from broiler chicks of control group differ significantly (P≤ 0.01) from other treatment group, which recorded the highest percentages (76.33 and 76.33%) respectively, while the lowest percentages recorded in breast and thigh meat (73.15 and 73.16%) respectively.

The breast and thigh protein results showed significant differ among treatments after supplement of probiotic (table 2 and 3), the percentages in breast and thigh meat from broiler chicks of T3 and T1 (adding 0.190 and 0.160g MiaClost/liter of drinking water) differ significantly (P≤ 0.01) with control group and not differ with T2, the highest percentages recorded in T3 and T1 in breast and thigh meat, it were (21.80, 21.77, 21.81 and 21.78%) respectively, while lowest percentages recorded in breast and thigh meat from broiler chicks of control group.

The results of Fat and Ash percentages in breast and thigh meat showed no significant (P≤ 0.01) differ among treatment after supplement feed with probiotic (Table 2 , 3).

Bansal, G. R. (2018). Found that there was no effect of the treatments on moisture, fat and ash content. However, the protein content was increase significantly in

broilers diet containing Probiotics, Tufarelli et al., (2017) found that increased protein percentages after using of probiotic in feed. These labile results of the effect of probiotics may be on account of aspects such as bacteria strains, scale of supplementation, diet composition, feeding management, feed shape and interaction with other dietary additives (Meng et al., 2010). According to the our results, crude protein amount in meat positively affected by using probiotics and same results recorded by Česlovas et al. (2005)

Table 2. Effect of Probiotic (MiaClost) on chemical composition of broiler chick breast meat

Treatments	Traits				
	Moisture	Protein	fat	Ash	%
Control	76.33 ± 0.33a	20.58 ± 0.22b	1.55 ±0.04a	1.09 ± 0.32a	98.64 ± 0.37a
T1	74.04 ± 0.54b	21.77 ± 0.33a	1.95 ± 0.54a	1.36 ± 0.14a	99.13 ± 0.32a
T2	73.90 ± 0.23b	21.17 ± 0.16ab	2.04 ± 0.15a	1.43 ± 0.18a	98.56 ± 0.29a
T3	73.15 ± 0.33b	21.80 ± 0.32a	1.96 ± 0.31a	1.40 ± 0.05a	98.33± 0.18a

The different letter in same column means significantly differ (P ≤0.01).

Table 3. Effect of Probiotic (MiaClost) on chemical composition of broiler chick thigh meat

Treatments	Traits				
	Moisture	Protein	fat	Ash	%
Control	76.33 ± 0.48a	20.58 ± 0.23b	1.56 ± 0.32a	1.09 ± 0.02a	98.64 ± 0.08a
T1	74.041 ± 0.43b	21.78 ± 0.63a	1.95 ± 0.05a	1.37 ± 0.16a	99.14 ± 0.20a
T2	73.91 ± 0.35b	21.18 ± 0.69ab	2.05 ± 0.18a	1.43 ± 0.21a	98.57 ± 0.08a
T3	73.16 ± 0.53b	21.81 ± 0.28a	1.97 ± 0.14a	1.40 ± 0.19a	98.34 ± 0.08a

The different letter in same column means significantly differ (P ≤0.01).

The results in the table (4) showed the effect of using probiotic (MiaClost) in pH value, the effect was not significant (P≤ 0.01) and pH value not differ in breast and thigh meat of broiler chicks in all treatment groups.

The results of Water Holding capacity value (WHC) affect significantly (P≤ 0.01) after using probiotic (MiaClost) (table 4), the WHC value in breast and thigh meat of broiler chicks from T2 (adding 0.175g MiaClost /liter of drinking water) differ significantly with WHC value in breast and thigh meat of broiler from T1 and T3 (adding 0.160 and 0.190g MiaClost /liter of drinking water) groups, and not differ with value of T1 group, the highest value recorded in breast and thigh meat of broiler chicks from T2 group, it were (34.99 and 49.83%) respectively, while the lowest value recorded in breast and thigh meat of broiler chicks from T3 group, it were(21.66 and 24.99%) respectively.

The results in table (4), showed that using probiotic (MiaClost) effect on cooking loss (CL) percentages in breast and thigh meat. The cooking loss percentages in breast and thigh meat from broiler chicks of T3 (0.190g MiaClost /liter of drinking water) groups differ significantly (P≤ 0.01) with breast and thigh meat of other groups, also CL percentage in breast and thigh meat from broiler chick of T2 (adding 0.175g MiaClost /liter of drinking water) group differ with meat of T1 and control groups, and CL percentages in breast and thigh meat of T1 and control groups not differ among others. The highest CL percentage recorded in breast and thigh meat from broiler chicks of T3 group, it were (43.12 and 41.00%) respectively, while the lowest percentages recorded in breast and thigh meat from broiler chick of T2, it were (36.00 and 32.62%) respectively.

According to Sanudo (1992), alteration of pH during the rigor mortis is important factor effect on meat quality. According to Jones & Grey (1989) and Sams & Mills (1993), normal pH values at the end of the post-mortem process are between 5.60 to 5.80 and 5.78 to 5.86, respectively. The data presented here are within these values independently of probiotics utilization. Same results found Quadros et al. (2001). Racevi Stupelien V, (2007) reported that Probiotic preparation positively impact on the water-holding capacity, and no effect in other parameters. The same result findings by Pelicano *et al.*, (2003) and Pelicano *et al.*, (2005). Good water holding capacity is fundamental in protein-based food products (Barbut, 1999, Trout, 1988), decrease weight loss during cutting and storage and improved capacity of the meat to retain water during processing.

Table 4. Effect of Probiotic (MiaClost) on physio-chemical traits of broiler chick thigh meat

Treatments	Traits					
	pH		WHC		CL	
	Breast	Thigh	Breast	Thigh	Breast	Thigh
Control	5.58 ± 0.19a	5.32 ± 0.06a	33.33±0.0ab	43.33± 0.0 ab	39.37 ±0.17b	34.75± 0.35bc
T1	5.17 ± 0.009a	5.36 ± 0.02a	28.33±2.35b	33.36±4. bc	40.62± 0.17b	35.62±0.53b
T2	5.34 ± 0.02a	5.51 ± 0.006a	34.99±2.35a	49.83±4.95a	36.00±0.70c	32.62±1.23c
T3	5.39 ± 0.02a	5.06 ± 0.33a	21.66±2.35c	24.99±2.35c	43.12±0.88a	41.00±1.41a

The different letter in same column means significantly differ (P ≤0.01).

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تأثير المعزز الحيوي (MiaClost) كمكمل في انتاجية الذبيحة، التركيب الكيميائي وجودة لحوم فروج اللحم|

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كان الهدف من هذه الدراسة دراسة تأثير المعزز الحيوي (MiaClost) على إنتاجية الذبيحة والتركيب الكيميائي ونوعية لحم دجاج التسمين. تم تطبيق التجربة على الافراخ بعمر أسبوع واحد، وشملت المعاملات التالية: المقارنة، (MiaClost 0.00 غرام/ لتر من مياه الشرب) ، T2: (إضافة 0.160 غرام MiaClost/ لتر من مياه الشرب) ، T3: (اضافة 0.175 غرام MiaClost / لتر من مياه الشرب) ، T4: (مضيفا 0.190 غرام MiaClost / لتر من مياه الشرب). بعد 42 يومًا من الفترة التجريبية ، كانت نتائج الاختبارات : أظهرت نتائج صفات وزن الجسم الحي ووزن الذبيحة في اختلافات معنوية ($P<0.01$) بين المعاملات ونتائج التركيب الكيميائي ، وأظهرت أن استخدام المعزز الحيوي ادى الى تقليل النسب المئوية للرطوبة معنويا ($P<0.01$) في لحم الصدر والفخذ ، وزيادة معنوية ($P<0.01$) في نسب البروتين في لحم الصدر والفخذ ، بينما التأثير كان غير معنوي ($P<0.01$) في نسبة الدهون والرماد لنوعي اللحوم . بالنسبة للصفات الفيزيائية ، لم تؤثر مكملات المعزز الحيوي في درجة الحموضة لحوم الصدر والفخذ ، بينما ادت إلى زيادة معنوية ($p<0.01$) في نسب القدرة على مسك الماء في لحوم الصدر والفخذ للمعاملة الثانية وانخفاضه في مجموعة المعاملة الثالثة ، الفقدان اثناء الطبخ ارتفع معنويا ($P<0.01$) عند استخدام المعزز الحيوي، حيث أن لحم الصدر والفخذ في المعاملة الثالثة سجل نسب مئوية أعلى ، في حين أن أقل نسبة مئوية سجلت في لحم الصدر والفخذ في المعاملة الثانية.