

EFFECT OF PROBIOTIC WITH ENZYMES MIXTURE AND DIETARY FAT SOURCE ON BROILER'S PERFORMANCE DURING FINISHER PHASE

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SUMMARY

An experiment was conducted to determine and compare the differences in production performance, carcass characteristics and economic evaluation of broiler chicks fed two different dietary oil sources (Soybean oil and palm oil), during finisher phase, (5-6 wks.) of age, with different mixture products of probiotic with multi enzymes (Zado or Amphi-Bact each at 0.5 kg/ton). A total of 180 unsexed five weeks of age Hubbard broiler chicks were distributed equally in a completely randomized design with 2 oil sources (O) x 3 feed additives (F), resulting in 6 treatments with 3 replicates of 10 chicks each. The results indicated that live body weight (LBW), daily weight gain (DWG), daily feed intake (DFI) and feed conversion ratio (FCR) were not affected significantly by oil source (O), feed additives (F) and their interaction (O*F). The best performance index (PI) and production efficiency factor (PEF) were detected for the chickens fed diets incorporated with, soy oil (116.83 and 333.82) and Zado supplementation being (118.03 and 337.24), respectively. Protein conversion ratio (PCR) and energy conversion ratio (ECR) were improved in response to dietary palm oil and Zado supplementation without significant difference between treatments. Carcass traits, edible parts and drumstick traits were not altered by oil source (O), feed additives (F) and their interaction (O x F). Economic evaluation showed that, relative economic efficiency was improved for broiler chickens fed palm oil diets or soy oil + Zado (0.5 kg/kg) diets. Finally, it could be concluded that, using palm oil or soybean oil with Zado (0.5 kg/ton) in finisher diets of Hubbard broiler chickens enhanced economic efficiency without adverse effect on many performance traits.

Keywords: *Dietary fat, probiotic, enzymes, broiler, performance, carcass.*

INTRODUCTION

Producers of poultry aim to provide high quality, homogenous products in as short a time as possible at minimal cost. Improving poultry performance by dietary manipulation has been the goal of nutritionists and using feed additives like enzymes (Zangiabadi and Toriki, 2010), Probiotic (Gill and Prasad, 2008 and Noufain *et al.*, 2008) and probiotic with enzymes (Rahman *et al.*, 2013) to improve performance, health status and dietary nutrient utilization has become popular during the last 15 years.

Bedford and Morgan (1996) concluded that exogenous enzymes could improve digestion for protein, starch and fat by removing the anti-nutritional factors, which interfere with normal processes of digestion or by digestion of fiber components that would otherwise pass undigested into the environment and extend the use of enzyme to play a significant role in health of the digestive tract. Moreover, several reports indicated that dietary enzymes or probiotic improve the health status and performance of poultry through enhancements in immune response, manipulation of gut microflora and pathogen inhibition, histological alterations in small intestine tissue and changes in blood biochemical parameters (Kalmendal and Tauson, 2012; and Deriu *et al.*, 2013).

An Egyptian patented product (Zado®), which is commercial anaerobic probiotic bacteria with enzyme mixture has been shown to improve broiler productivity and recorded higher dressing and immune organs relative weight at 42 days of broiler chicken age (Safaa, 2013). Moreover, El-Sanhoury and Ahmed (2017) indicated that the use of (Zado®) at 0.5 kg/ton broiler feed affect positively in the body weight, feed conversion ratio, intestine enzymes activities and good of economic efficiency. In addition, dietary Zado® has a favor effects on lipid metabolism and modifies blood metabolites. However, it has been reported also that enzyme supplementation influences the absorption of fats and

fatty acids as well as fat-soluble micro-constituents contained in the diets (Danicke *et al.*, 1999). On the other hand, several reports related to improve broiler performance resulting from adding different dietary oil and fat sources to broiler diets (Azman *et al.*, 2005; Nematallah *et al.*, 2014 and Abdulla *et al.*, 2016). However, many conflicting and inconsistent reports appeared in literature about the performance of growing chicks that fed diets supplemented with vegetable oils. Abou El-Wafa *et al.* (2000) studied the effect of replacing soybean oil with different sources of oil (corn oil and sunflower oil) and fats (Camel fat and margarine) in broiler diets. They found that added oils or fats improved growth rate and feed conversion compared with animal fats, however, they found no significant differences in carcass characteristics due to feeding either the tested oils or fats. Also, Abdulla *et al.* (2016) found that the lower average daily gain was observed for broiler chickens fed linseed oil compared with soybean oil and palm oil and no significant differences in daily feed intake and feed conversion ratio were found among the various dietary oils. On the contrary, Ayad *et al.* (2015) showed that feeding broiler chicks on palm oil at 3% or on free fat diet had superior effects on final productive performance of chicks compared to feeding on 3% soybean oil.

Little information is available regarding the relationship between Zado or Amphi-Bact as probiotic with enzymes mixture products and performance of broiler chicks fed diets with different sources of oil (soybean oil and palm oil) during finisher phase. So, the objective of this study was to evaluate the growth performance, carcass characteristics and economic efficiency of broiler chicks fed finisher diets (5-6 wks of age) containing different types of traditional oil sources (soybean oil and palm oil) with or without probiotic with enzyme products (Zado or Amphi-Bact).

MATERIALS AND METHODS

This experiment was conducted at Poultry Experimental Unit, Agriculture Research Station, Qalyubia Governorate, Faculty Agriculture, Ain Shams University.

Birds, housing and experimental design:

A total of 180 one day old Hubbard broiler chicks (mixed sex) were divided into 6 equal treatments groups, each included 3 replicates with 10 chicks, which were housed into 18 experimental cages in three-deck cage system and received the experimental diets and water in electrically heated battery brooders with raised wire floors. Environmental temperature was maintained at $32\pm 0.5^{\circ}\text{C}$ during the first week of life and then decreased gradually until reaching $24\pm 0.5^{\circ}\text{C}$ at 6 weeks of age with a twenty-four hours light program. Chicks were vaccinated against main diseases (Marke's, Newcastle and Infectious Bronchitis). The growth experiment was carried out from 5 to 6 weeks of age. A typical starter (0-2 weeks), grower (3-4 weeks) and finisher (5-6 weeks) diets based on corn-soybean meal diets were formulated to meet the nutrient requirements of the broiler chicks (NRC, 1994) which are presented in Table (1).

At finisher period (5-6 weeks), the first and second treatment groups were served as control and fed basal finisher diets with soybean oil or palm oil, respectively. While, the other four groups received the basal finisher diets (soybean oil or palm oil) supplemented with commercial probiotic with enzymes mixture products (Zado®, a mix of anaerobic bacteria and xylanases (2.3 unit/g), cellulases (7.1 unit/g), alpha amylase (61.5 unit/g) and protease (29.2 unit/g) in a powder form or Amphi-Bact®, a mix of lactic acid bacteria and 34.5 units/g total enzymes, (Amylase, cellulase, Beta-glucanase and Hemicellulase).

Productive performance:

Measurements of live body weight (LBW) and feed intake (FI) were recorded by replicate and mortality was recorded daily. From these data, daily weight gain (DWG), daily feed intake (DFI), feed conversion ratio (FCR), protein conversion ratio (PCR), energy conversion ratio (ECR) were calculated. Performance index (PI) and production efficiency factor (PEF) were calculated according to North (1981) and Emmert (2000), respectively.

Slaughter traits:

Four chickens of six weeks of age per treatment were selected for calculation of carcass edible and inedible parts, carcass cuts (neck, wings, drum sticks, thighs and breast %) and some drumstick traits (% skin, muscle and bone).

Table (1): Feed ingredients and calculated analyses of basal and experimental diets.

Ingredients	Starter 0-2 weeks	Grower 3-4 weeks	Finisher 5-6 weeks					
			Soybean Oil			Palm Oil		
			None	Zado 0.5 Kg/ Ton	AmphiBact 0.5 Kg/ Ton	None	Zado 0.5 Kg/ Ton	AmphiBact 0.5 Kg/ Ton
Corn yellow (grains)	52.05	55.91	56.80	56.80	56.80	56.80	56.80	56.80
Soybean Meal (44%)	31.50	30.00	28.25	28.25	28.25	28.25	28.25	28.25
Corn Gluten Meal (62%)	7.20	4.86	4.40	4.40	4.40	4.40	4.40	4.40
Soybean Oil	3.00	3.65	5.00	5.00	5.00	-	-	-
Palm Oil	-	-	-	-	-	5.00	5.00	5.00
Wheat Bran	2.00	1.50	2.00	2.00	2.00	2.00	2.00	2.00
Di-Calcium Phosphate	1.85	1.60	1.34	1.34	1.34	1.34	1.34	1.34
Calcium Carbonate	1.30	1.50	1.35	1.35	1.35	1.35	1.35	1.35
DL-Methionine	0.29	0.28	0.21	0.21	0.21	0.21	0.21	0.21
L-Lysine HCL	0.21	0.10	0.05	0.05	0.05	0.05	0.05	0.05
Premix	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Salt (NaCl)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Total	100	100	100	100	100	100	100	100
<i>Calculated analysis:</i>								
Crude Protein %	23.06	21.18	20.06	20.06	20.06	20.06	20.06	20.06
ME Kcal/ Kg diet	3031	3076	3207	3207	3207	3171	3171	3171
Calcium %	1.00	1.01	0.90	0.90	0.90	0.90	0.90	0.90
Available Phosphorus %	0.50	0.45	0.40	0.40	0.40	0.40	0.40	0.40
Lysine %	1.30	1.15	1.06	1.06	1.06	1.06	1.06	1.06
Methionine & Cysteine %	0.97	0.93	0.84	0.84	0.84	0.84	0.84	0.84
Price	7022	6875	6657	6684	6689	6404	6434	6439

Each 3 Kg of premix contains: Vitamins: A: 12000000 IU; Vit. D3 2000000 IU; E: 10000 mg; K3: 2000 mg; B1:1000 mg; B2: 5000 mg; B6:1500 mg; B12: 10 mg; Biotin: 50 mg; Choline chloride: 250000 mg; Pantothenic acid: 10000 mg; Nicotinic acid: 30000 mg; Folic acid: 1000 mg; Minerals: Mn: 60000 mg; Zn: 50000 mg; Fe: 30000 mg; Cu: 10000 mg; I: 1000 mg; Se: 100 mg and Co: 100 mg.

Economic traits:

The economic efficiency of broiler chickens was calculated according to the local market price of feed ingredients as well as feed additives (Zado® and AmphiBact®), at the time of the experiment.

Statistical analysis:

The collected data were subjected to two-way analysis of variance to detect the effects of oil source (O), feed additives (F) and their interactions (O*F) using the general linear model (GLM) procedure of SAS (SAS, 2004) according to the following model:

$$Y_{ijk} = \mu + O_i + F_j + (O * F)_{ij} + e_{ijk}$$

Where: Y_{ijk} = Trait measured, μ = Overall mean, O_i = Oil source, $I = (1, 2)$, F_j = Feed additives, $j = (1, 2, 3)$,

$(O*F)_{ij}$ = interaction between oil source and feed additives and e_{ijk} = Experimental random error.

In addition, Duncan's multiple range test (Duncan, 1955) was used to separate means when separation was relevant. Statistical significance was accepted at probability level of ($P \leq 0.05$).

RESULTS AND DISCUSSION

Productive:

Effect of different dietary treatments on live body weight (LBW), daily weight gain (DWG), daily feed intake (DFI) and feed conversion ratio (FCR) during experimental period are presented in Table (2).

In general, no significant effect was observed in LBW and DWG among the experimental groups during experimental period (5-6 wks.). It is worth to note that broiler chicks fed (palm oil) diets reflected the lowest insignificant DWG compared with those fed (Soybean bean soil) diets and the corresponding values were (79.30 and 80.58) respectively. On the other hand, inclusion of broiler diets with Zado and Amphi-Bact led to numerical decrease in the DWG by 1.68 and 4.52%, respectively compared with that fed non-dietary probiotic additive diets (NPA).

Data in Table (2) indicate that (DFI) per chick (g/d) increased by feeding (soybean oil) diets compared with those fed (palm oil) diets, the corresponding figures were 147.67 versus 146.96 (g/c/d), without significant differences. However, inclusion of Zado or Amphi-Bact in the broiler diets reflected insignificant reduction in the (DFI) compared with NPA diets (142.39, 146.70 versus 152.89), respectively. Feed conversion ratio (FCR) showed the same trend since chicks fed soybean oil diets were more efficient in converting their food into BWG compared with those fed palm oil diets. The corresponding figures were 1.86 versus 1.88 without significant differences between the two treatments. In the same order, the figures of FCR indicated insignificant differences between chicks fed diets supplemented with different probiotic additive compared with those fed NPA diets. The best FCR was detected for the chickens fed diets supplemented with 0.5 kg/ton Zado (1.80) and the worst FCR were found in chicken fed 0.5 kg/ton Amphi-Bact (1.92) compared with that fed NPA diets (1.88), which could be due to the lowest DWG in case of (Amphi-Bact) and lowest FI in case of Zado supplemented groups compared with the NPA groups. Results in Table (2), indicated that inclusion of (soybean oil) in the broiler diets increased DWG and DFI and improved FCR, while Zado supplementation reduced DFI and improved FCR through the trail which indicate that either soybean oil or Zado indeed exerted some positive effect on broilers. Results of the current study agree with those by Abdulla *et al.* (2016) who fed broiler with different oil sources (palm oil, soybean oil or linseed oil) and observed no significant differences in DFI and FCR among the various dietary oils. Also, Velasco *et al.* (2010) found that BWG of broiler chickens was not influenced by feeding either palm oil or sunflower oil, but feed intake and FCR were inferior ($P < 0.001$) in birds fed palm oil diets. On the contrary, Ayad *et al.* (2015) showed that broiler chicks fed 3% palm oil had superior effects on final productive performance of chicks compared to feeding 3% soybean oil. On the other hand, previous studies examining the effects of probiotics showed inconsistent effect on broiler performance (Ergum *et al.*, 2000, Kumprechtova *et al.*, 2000 and Willis *et al.*, 2007) who found no or minimal effect of probiotic supplementation on broiler performance. However, other researchers have found that probiotics were the most effective growth promoter and improved BWG and FCR in chickens (Amerah *et al.*, 2012 and Safaa, 2013).

Performance index (PI) and production efficiency factor (PEF)

Insignificant differences were observed in PI and PEF with experimental treatments during experimental period (Table 2). PI Figures ranged between 116.83 and 113.08 for (oil sources) and 118.03 and 113.13 for (dietary additives). In the same order, the figures of PEF indicated insignificant differences between chicks fed diets containing different oil sources (333.82 versus 323.13) or different dietary additives (337.24 and 323.24) compared with those fed NPA diets (324.95). The best PI and PEF were detected for the chickens fed diets incorporated with, soybean oil (116.83 and 333.82) and Zado supplementation being (118.03 and 337.24), respectively. In this connection, Rayan *et al.* (2015) showed that commercial multi enzymes (phytabex plus) supplementation in cobb broiler diets at level of 200 g/ton had the best PI and PEF as compared with control diet. In addition, Zado supplementation to broiler diets improved broiler productivity and might improve immunity (Safaa, 2013).

Protein conversion ratio (PCR) and energy conversion ratio (ECR)

Results of PCR and ECR of broiler chicken at 6wks of age are presented in Table (2). Results indicated that PCR and ECR were improved in response to dietary palm oil compared to soybean oil being 0.37 versus 0.38 for PCR and 5.98 versus 6.08 for ECR, respectively, without any significant differences. This might be due to the fact that broiler chickens fed palm oil diets contained lower energy, lower calorie/protein ratio and lower daily feed intake (146.96, g/d) could be related to the fact that birds met their energy requirements by increasing feed intake. According to Lesson and Summers (1991), birds have the ability to meet their energy requirements to certain extent by increasing feed consumption. In the same order, the figures of PCR and ECR indicated insignificant differences between chickens fed diets supplemented with dietary feed additives compared with those fed NPA diets.

Table (2): Effect of dietary treatments on live body weight (LBW), daily weight gain (DWG), daily feed intake (DFI), feed conversion ratio (FCR) and growth rate (GR) within 35-42 days of age.

Items	Oil Source (O)	Dietary feed additive			Overall
		None	Zado 0.5 Kg/ Ton	AmphiBact 0.5 Kg/ Ton	
LBW (at 5 weeks)	Soybean Oil	1530.01±38.97	1571.67±71.87	1532.17±54.71	1544.61
	Palm Oil	1519.50±41.60	1487.17±16.27	1546.01±43.21	1517.56
	Overall	1524.75	1529.42	1539.08	
LBW (at 6 weeks)	Soybean Oil	2090.01±59.54	2170.17±88.95	2066.50±96.31	2108.89
	Palm Oil	2102.50±78.39	2012.67±47.59	2102.83±64.08	2072.67
	Overall	2096.25	2091.42	2084.67	
DWG (5-6 weeks)	Soybean Oil	80.01±4.77	85.46±7.19	76.31±6.68	80.58
	Palm Oil	83.27±7.06	75.06±5.50	79.57±4.11	79.30
	Overall	81.63	80.26	77.94	
DFI (5-6 weeks)	Soybean Oil	152.52±10.87	146.60±9.34	143.96±8.83	147.67
	Palm Oil	153.25±8.06	138.19±6.02	149.44±8.43	146.96
	Overall	152.89	142.39	146.70	
FCR (5-6 weeks)	Soybean Oil	1.91±0.06	1.74±0.09	1.93±0.14	1.86
	Palm Oil	1.87±0.10	1.87±0.11	1.91±0.15	1.88
	Overall	1.88	1.80	1.92	
PI ¹	Soybean Oil	112.86±6.15	126.21±7.76	111.42±12.78	116.83
	Palm Oil	114.59±9.39	109.84±8.65	114.84±11.85	113.09
	Overall	113.73	118.03	113.13	
PEF ²	Soybean Oil	322.47±17.59	360.63±22.18	318.35±36.53	333.82
	Palm Oil	327.42±26.85	313.84±24.74	328.11±33.87	323.13
	Overall	324.95	337.24	323.24	
PCR g protein/ g gain	Soybean Oil	0.41±0.01	0.35±0.01	0.38±0.02	0.38
	Palm Oil	0.37±0.01	0.37±0.02	0.38±0.03	0.37
	Overall	0.39	0.36	0.38	
ECR Kcal/ g gain	Soybean Oil	6.58±0.22	5.52±0.29	6.14±0.45	6.08
	Palm Oil	5.93±0.31	5.95±0.35	6.06±0.49	5.98
	Overall	6.26	5.74	6.09	
<i>Probability</i>					
Trait	O	F	O*F		
LBW (at 5 weeks)	NS	NS	NS		
LBW (at 6 weeks)	NS	NS	NS		
DWG (5-6 weeks)	NS	NS	NS		
DFI (5-6 weeks)	NS	NS	NS		
PI ¹	NS	NS	NS		
PEF ²	NS	NS	NS		
PCR	NS	NS	NS		
ECR	NS	NS	NS		
FCR (5-6 weeks)	NS	NS	NS		

Means within the same row or column with different superscripts are significantly different. NS = Non-Significant. 1: North (1981), 2: Emmert (2000).

The best PCR and ECR was detected for the chickens fed diets supplemented with Zado (0.36 and 5.74), respectively. While, the worst PCR (0.39) and ECR (6.26) were found in chickens fed NPA diets. However, the differences between treatments were insignificant. In this connection, Younis *et al.* (2016) reported that broilers fed diets supplemented with coated organic acids, essential oils or probiotic tend to improve PCR by 6.5, 5.6 and 44.79%, respectively compared with those fed the control diets.

Carcass characteristics and some drumstick traits:

Data in Table (3 and 4) shows the effect of different treatments on carcass characteristics and some drumstick traits of broiler chickens slaughtered at the end of 42 days of age. Treatments had no significant effects on carcass %, total edible parts % (hot carcass weight + giblets weight) %, body fats %, breast % and drumstick traits (skin %, muscle % or bone %).

Table (3): Effect of dietary treatments on carcass traits and edible parts (%).

Items	Oil Source (O)	Dietary Enzymatic Additive (E)			Overall
		None	Zado 0.5 Kg/ Ton	AmphiBact 0.5 Kg/ Ton	
Dressed carcass	Soybean Oil	72.75±1.10	74.77±0.68	75.14±0.43	74.22
	Palm Oil	74.37±1.02	73.06±0.99	73.59±0.44	73.67
	Overall	73.56	73.91	74.37	
Breast	Soybean Oil	41.75±2.40	41.88±0.65	42.50±0.78	42.04
	Palm Oil	39.80±1.57	40.91±0.28	41.10±1.46	40.60
	Overall	40.78	41.39	41.80	
Body Fats *	Soybean Oil	2.79±0.74	1.96±0.27	1.71±0.40	2.15
	Palm Oil	1.95±0.54	2.45±0.29	2.30±0.41	2.23
	Overall	2.37	2.20	2.01	
Liver	Soybean Oil	2.17±0.10	1.97±0.09	1.90±0.22	2.01
	Palm Oil	1.71±0.23	1.97±0.14	2.06±0.22	1.92
	Overall	1.94	1.97	1.98	
Gizzard	Soybean Oil	1.57±0.08	1.27±0.07	1.36±0.11	1.40
	Palm Oil	1.49±0.02	1.34±0.11	1.41±0.13	1.41
	Overall	1.53	1.30	1.38	
Heart	Soybean Oil	0.59±0.04	0.50±0.02	0.49±0.03	0.53
	Palm Oil	0.54±0.03	0.52±0.03	0.49±0.01	0.52
	Overall	0.56	0.52	0.49	
Giblets	Soybean Oil	4.33±0.09	3.74±0.17	3.74±0.16	3.94
	Palm Oil	3.74±0.25	3.84±0.19	3.95±0.36	3.84
	Overall	4.04	3.79	3.85	
Total edible	Soybean Oil	77.09±1.19	78.51±0.79	78.89±0.27	78.17
	Palm Oil	78.11±0.77	76.90±0.83	77.55±0.09	77.53
	Overall	77.60	77.71	78.22	
Probability					
Trait	O	F	O*F		
Dressed carcass %	NS	NS	NS		
Breast %	NS	NS	NS		
Body fats %*	NS	NS	NS		
Breast %	NS	NS	NS		
Liver %	NS	NS	NS		
Gizzard %	NS	NS	NS		
Heart %	NS	NS	NS		
Giblets %	NS	NS	NS		
Total edible %	NS	NS	NS		

Means within the same row or column with different superscripts are significantly different. NS = Non Significant
 Body fats = abdominal fat + Gizzard fat + Heart fat.

Table (4): Effect of dietary treatments on some drumstick traits.

Items	Oil Source (O)	Dietary Feed Additive (F)			Overall
		None	Zado 0.5 Kg/ Ton	AmphiBact 0.5 Kg/ Ton	
Drum Sticks % *	Soybean Oil	13.52±1.05	13.85±0.49	13.07±0.22	13.48
	Palm Oil	13.34±0.57	13.08±0.42	12.86±0.55	13.09
	Overall	13.43	13.47	12.96	
Drumstick skin %	Soybean Oil	10.65±1.42	10.12±1.30	9.37±1.06	10.05
	Palm Oil	10.02±0.80	10.52±0.66	9.69±0.27	10.08
	Overall	10.34	10.32	9.53	
Drumstick muscle %	Soybean Oil	66.05±1.50	68.21±1.22	68.70±0.92	67.65
	Palm Oil	69.06±0.54	65.66±5.18	65.53±0.77	66.75
	Overall	67.55	66.94	67.11	
Drumstick bone %	Soybean Oil	23.29±1.52	21.65±0.33	21.92±1.86	22.29
	Palm Oil	20.91±1.02	23.81±5.45	24.77±0.91	23.16
	Overall	22.10	22.73	23.34	
Probability					
Trait	O	F		O*F	
Drum Sticks % *	NS	NS		NS	
Drumstick skin %	NS	NS		NS	
Drumstick muscle %	NS	NS		NS	
Drumstick bone %	NS	NS		NS	

Means within the same row or column with different superscripts are significantly different. NS = Non Significant

Chickens fed soybean oil diets reflected the highest carcass and total edible parts percentages compared with that fed palm oil diets. However, carcass% increased by 0.74% (74.22 versus 73.67%) and total edible parts % showed similar trend (78.17 versus 77.53 %). On the other hand, broiler chickens given Amphi-Bact (0.5 kg/ton) led up to clear numerical increase in the carcass % (74.37), total edible parts% (78.22) and breast % (41.80) compared with other dietary treatments. In this respect, Bobadoye *et al.* (2008); Alizadeh *et al.* (2012) and Duraisamy *et al.* (2013) reported that different fat sources and their combination had no effect on carcass characteristics.

In partial agreement, Abdulla *et al.* (2016) showed no significant differences in weight of liver, gizzard and heart when broilers were fed palm oil, soybean oil or linseed oil. However, birds fed palm oil recorded higher abdominal fat (P<0.05) than those of other sources. Moreover, results of the current study agree with those obtained by Ali (1999), Abdel-Azeem and Hamid (2006) and Nematallah *et al.* (2015) who detected that there were no significant differences in absolute and relative weights of empty carcass, total giblets, abdominal fat and total edible parts between the control group and the birds fed diets supplemented with probiotics.

Economic traits:

Data for economic evaluation are summarized in Table (5). The economic evaluation was calculated on the basis of prices of local market for feed ingredients, feed additives, one day old chick and kg of live body weight of chicken during the experimental period. The obtained results showed that palm oil incorporated on the expense of soybean oil supported the calculated economic efficiency percentages of broiler chickens and the corresponding values were 143.21 (110%) and 132.25 (100%), respectively. On the other hand, it is clear that feeding broiler chicks on NPA diets (without probiotic additive) increased the feeding cost and total cost compared with those fed other dietary treatments. The best economic efficiency and relative economic efficiency were detected for the chickens fed diets incorporated with (soybean oil + Zado) being (15.97 and 166.08%), respectively. These results agree with those reported by Tammam (2015) who concluded that both palm oil as traditional oil source and fatty acid mix as untraditional fat source recorded the best economic efficiency compared with soybean oil and other fat sources dry fat and full-fat soy. However, Ibrahim (2005) reported that there was no significant effect of dietary sunflower oil, palm oil, cotton seed oil, distilled fatty acids and nutria fat on economic efficiency of silver Montazah growing chicks.

Table (5): Effect of dietary treatments on economic traits.

Items	Dietary Treatments					
	Soybean Oil			Palm Oil		
	None	Zado 0.5 Kg/ Ton	AmphiBact 0.5 Kg/ Ton	None	Zado 0.5 Kg/ Ton	AmphiBact 0.5 Kg/ Ton
Average feed consumption (Kg)	1.06	1.02	1.01	1.07	0.97	1.04
Total cost (LE)*	52.88	46.88	45.80	45.81	44.38	46.38
Feed cost (LE)	6.78	6.58	6.49	6.81	6.21	6.73
Live body weight (Kg)	2.32	2.17	2.06	2.11	2.01	2.10
Total return [#] (LE)	58.01	54.25	51.66	52.56	50.31	52.57
Net return (LE)	5.11	7.37	5.86	6.75	5.93	6.18
Economic efficiency	9.62	15.97	12.57	14.67	13.30	13.34
Relative economic efficiency	100.00	166.08	130.69	152.56	138.33	138.73
Mean economic efficiency		132.25 (100 %)			143.21 (110 %)	

* Price of 5wks old chick + incidental costs.

According to the local price of Kg LBW, which was 25.00 L.E.

In the same order, similar observations were reported by other investigators Abd-Elsamee and Abd El-Hakim (2002); Abdel-Azeem and Hamid (2006); and Nematallah *et al.* (2015) who all reported that symbiotic or probiotic improved economic efficiency in broiler diets.

CONCLUSION

From the present results, it could be stated that, productive performance and carcass characteristics of broiler chickens were not affected by different dietary treatments (oil sources and mixture of probiotic with enzymes) at finisher diets. Moreover, feeding diets containing palm oil or soybean oil + Zado (0.5 kg/ton) presented higher relative economic efficiency.

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تأثير خليط البروبيوتيك مع الإنزيمات ومصدر دهون العليقة على الأداء الإنتاجي لبدارى التسمين خلال مرحلة الناهي

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أجريت تجربة لتقييم ومقارنة مصدرين من الزيوت النباتية (زيت صويا وزيت نخيل) في علائق الناهي (5-6 أسبوع) من العمر لبدارى التسمين مع أو بدون إضافة مصادر مختلفة من المستحضرات التجارية محتوية علي (بروبيوتك + مخلوط إنزيمات) زادو (0,5 كجم/طن) أو أمفياكت (0,5 كجم/طن) على الأداء الإنتاجي وصفات الذبيحة والعائد الاقتصادي.

استخدم في التجربة 180 بدارى تسمين عمر 5 أسبوع غير مجنس من سلالة الهابرد وزعت عشوائياً بالتساوي في تجربة عاملية مكونة من 6 معاملات تحتوي علي مصدرين من مصادر الزيوت النباتية (زيت صويا أو زيت نخيل) مع المستحضرات التجارية (بدون ، 0,5 كجم /طن زادو ، 0,5 كجم/طن أمفياكت) بكل معاملة 3 مكررات وبكل مكرر 10 طيور.

أظهرت النتائج ما يلي :

- لم يتأثر معنوياً الأداء الإنتاجي لبدارى التسمين (وزن الجسم الحي والزيادة الوزنية اليومية واستهلاك العلف اليومي ومعامل التحويل الغذائي) بمصدر الزيت أو المستحضرات التجارية أو التداخل بينهما.

- أفضل قيم العامل الإنتاجي (PI) وعامل الاستفادة الإنتاجية (PEF) سجلتها الطيور المغذاة على عليقة مضاف إليها زيت الصويا (116,83 و333,82) أو الزادو (118,03 و337,24) على التوالي.

- أفضل قيم لمعامل تحويل البروتين (PCR) ومعامل تحويل الطاقة (ECR) سجلتها الطيور المغذاة على علائق مضاف إليها زيت النخيل أو الزادو بدون فروق معنوية بين المعاملات.

- لم تتأثر صفات الذبيحة والأجزاء المأكولة وكذلك صفات الدبوس بمصدر الزيت أو المستحضرات التجارية أو التداخل بينهما.

- سجلت الكفاءة الاقتصادية النسبية أعلى متوسط لبدارى التسمين المغذاة على علائق مضاف إليها زيت النخيل أو زيت الصويا مضاف إليه زادو (0,5 كجم/طن).

توصي الدراسة باستخدام زيت النخيل أو زيت الصويا + الزادو في علائق الناهي لبدارى التسمين للحصول على أفضل عائد اقتصادي بدون التأثير على الصفات الإنتاجية.