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Effect of Bio-Growth Promoters Supplementation to Layer Diets on: 1- Improving Unsaturated Fatty Acids Contents (Ω-3) in Table Egg Yolk (Running Title: Fungus, Yeast and Bacteria in Layer Diets)

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ABSTRACT

The purpose of this trial was to study the effects of Sccharomyces cerevisiae (Scc); Aspergillus awamori (Asp); lactobacillus (Lac) and its mixtures as Probiotics in Gimmizah hens diets on egg quality, plasma lipids, and fatty acid profile in egg yolk. ninety six, 28 weeks old hens were fed on: layer diet as control group; layer diets contained, 0.10% Scc ; 0.05% Asp; 0.10% Lac or a mixture of Scc and Asp; Scc and Lac; Asp and Lac; Scc, Asp and Lac. The experimental period was 16 weeks. Egg and albumen weights were increased in all treatments compared to the control group. The synergistic effects ($P<0.05$) of Scc, Asp and Lac on egg weight and yolk color scores were observed. Dietary experimental treatments did not affect the weights of the shell and yolk, also, the height of the egg yolk or albumen. On the other hand, the synergistic effect attributed to the combination of Asp and Lac caused significant reduction in plasma total cholesterol, triglycerides and LDL ($P<0.01$), while, Plasma HDL increased significantly ($P<0.01$) in all treatment groups as compared to control group. Interestingly, the saturated (SFA) and unsaturated fatty acids (USFA) in egg yolks of the treatments compared to the control. In conclusion, the combined supplementation of the biological growth promoters (Saccharomyces cerevisiae, Aspergillus awamori and Lactic acid bacteria) in the hen's diet can change the fatty acid composition of the egg yolk and improve egg quality.

Keywords: Bio-growth promoters, hens, fatty acids, egg quality.

INTRODUCTION

Breeders in poultry farms that fundamentally raise laying hens are focus on increasing weight of eggs, egg yield additionally increasing internal quality (decreasing egg content of cholesterol to enhance economic performance and market portion). When breeders trying to enhance the quality of egg, they should give careful consideration to the component of egg production and the health condition of the layers.

For centuries, Probiotics and prebiotic have been consumed as natural ingredients in food or fermented foods. Probiotics are live microbial feed supplements which beneficially affect the host animal by improving its intestinal microbial balance. For that, several microorganisms have been used in Probiotic preparations for animal feed. These are lactic acid bacteria (Lac), Aspergillus, Lactobacillus acidophilus L. bulgaricus, Lactobacillus casei, Streptococcus thermophilus, Enterococcus faecalis, Bifidobacterium. In this series, Fuller (1989) reported that all previous strains are gut strains, except Lactobacillus bulgaricus and Streptococcus thermophilus, which are considered to be yogurt starter organisms.

Many *in vivo and in vitro* studies demonstrated that commensal intestinal microbiota can restrain pathogens. Intestinal microbiota disorders can lead to pathogen infection, while the prebiotics and probiotics addition increases protection against harmful microorganisms (Stavric and Kornegay, 1995; Rolfe, 2000). Davis and Anderson, 2002; Balevi *et al.*, 2009 and Saleh *et al*. (2017) showed that adding probiotics to laying hens' diets help to increase feed efficiency and egg production due to increased nutrient digestibility. Moreover, probiotics can control the growth of pathogenic bacteria, which then help to modulate intestinal microflora (Yu *et al*., 2008). In addition, dietary probiotics is important in lipid metabolism alteration in hens and broilers. In this respect, Mohan *et al.* (1995) indicated that probiotics can reduce total cholesterol and triglyceride levels in egg yolk and serum (Kalavathy *et al.*, 2009; Saleh *et al*. 2012b; Saleh 2013, 2014).

Many authors have used Aspergillus awamori and yeast (especially Saccharomyces cerevisiae) as probiotics (Montes and Pugh, 1993; Kautz and Arens, 1998; Saleh *et. al*., 2011, 2012a). The Aspergillus and Saccharomyces have many industrial applications including those brewing, distillation and baking industries (Raper and Fennell, 1965). So far, information on Probiotics based on Aspergillus awamori has been lacking, although its use in poultry production is increasing (Saleh *et al*., 2011). Lactic acid bacteria are symbiotic in the digestive tract of birds which enhance immunity by controlling pathogenic bacteria (Zulkifli *et al*., 2000). Lactic acid bacteria have adhesive properties and can be colonies' different parts of digestive tract (Jin *et al*., 1997). In this regard, the aim of this study was to explore Saccharomyces cerevisiae, Aspergillus awamori and Lactobacillus as probiotic strains, and to study the synergistic effect of their combinations on egg quality, fatty acid profile in egg yolk and some plasma variables in Gimmizah laying hens.

MATERIALS AND METHODS

The experiment was conducted at the poultry farm at El-Gimmizah station, which belongs to the Animal Production Research Institute, Agricultural Research Center. All procedures used in this study were approved by the Animal Ethics Committee of the Animal Production Research Institute, Agricultural Research Center (Egypt) .

Experimental birds and diet

Ninety-six Gimmizah hens (28 weeks old) had nearly similar body weight (BW) were immunized for infectious bronchitis (IB) and Newcastle disease virus (NDV), also, for drop syndrome disease of egg. Birds were randomly divided into 8 experimental groups (12 laying hens in each, which were housed individually in galvanized wire cages. Each cage is outfitted with a separate nipple drinker and individual metal feed trough. The photoperiod was 16 hours a day. All hens are kept under the same environmental and hygienic conditions. The study started at 28 weeks of age and lasted for 16 weeks (44 weeks of age). Hens of control group were fed a corn-soy basal diet without any additives. The basal diet (BD) was formulated to meet or exceed layer requirements (CP 17% and ME 2750 kcal / kg). The other 7 experimental groups, depending on the type of probiotics added, were classified as follows: the BD supplemented with 0.1% Saccharomyces cerevisiae (Scc), 0.05% Aspergillus awamori (Asp), 0.1% lactic acid bacteria (Lac) and a mixture of the three probiotics. The yeast, fungi and bacteria used here were mixed in the basal diet. The number of S. cerevisiae spores was 2 x 1010 CFU / g, the Aspergillus spores were about 25 x 104 / g diet and lactic acid bacteria (Lactobacillus planetarium) F-564 CFU 1.2 x 1012 /g.

Recorded Features and Applied Methods:

Egg Quality and yolk fatty acids:

Egg quality examination (shell, egg yolk and albumen weights, egg yolk and albumen heights, and egg yolk color) were measured at 36 (wks) age and at the end of the experiment. Five eggs were taken randomly from each experimental group at 36 weeks and 44 weeks of age. Eggs were weighed individually. After breaking the eggs, the albumen and yolk height were measured. The yolk color score was determined by Roche yolk color fan. The albumen weight was calculated by subtracting the weight of the yolk and shell from the whole egg weight. Adherent albumen in eggshell was cleaned and membrane was removed, the shell was dried (at room temperature) and then weighed to the nearest 0.01 g. evaluation of egg quality and weight was performed on individual eggs. Fatty acid profiles in diet and egg yolk were measured according to the method of Saleh (2013).

Blood plasma variables:

Blood samples were taken from five hens in each treatment from wing vein of into heparinized tubes. Blood plasma was isolated by centrifugation at 4000 rpm for 10 min. Plasma concentrations [glucose, total cholesterol, triglycerides, high density lipoprotein (HDL), low density lipoprotein (LDL) and activity of transaminases (AST and ALT) were calorimetrically determined by commercial kits, (Bio-Merieux Moreyl Rtiols charborm minerels), Raiss/France).

Table 1. The composition of the basal (control) diet.

Ingredients	%
Yellow corn	65.24
Soybean meal 44% CP	25.00
Dicalcium phosphate	1.50
Limestone	7.60
Sodium chloride	0.30
Vit. & Min.-premix	0.30
DL-Methionine	0.06
Total	100
Calculated analysis**:	
CP%	16.54
ME (Kcal/kg)	2743
Ether extract %	2.67
Crude fiber %	2.80
Calcium %	3.33
Avaliable phosphorus %	0.51
DL-Methionine %	0.32
L-Lysine %	0.83

CP: Crude protein, ME: metabolizable energy
*** Each 3 Kg of Vit and Min. premix contains: Vit. A (10000000 IU), vitD3 (2000000 IU), Vit.E (10000mg), Vit.K3 (1000mg), Vit. B1 (1000mg), Vit. B2 (5000mg), Vit. B12 (10 mg), Vit. B6 (1500mg), Niacin (30000mg), Pantothenic acid (10000mg), Folic acid(1000mg) Biotin (50mg), Choline (300000 mg), Copper (4000 mg), Iodine(300mg), Iron (30000 mg), Zinc (50000 mg) Manganese (60000 mg), Selenium (100mg) and 100mg Cobalt and $CaCO_3$ as carrier to 3000g. **Calculated analysis according to NRC (1994).**

Table. 2. Fatty acids profile of the experimental diets ($g.100\ g^{-1}$) *

Fatty acids	Experimental diets							
	1	2	3	4	5	6	7	8
C14:0	0.22	0.46	0.29	0.45	0.28	0.35	0.47	0.58
C16:0	11.65	12.68	13.11	10.71	11.76	9.98	10.76	10.99
C18:0	3.67	4.05	2.23	3.31	2.98	4.16	2.47	3.16
C18:1	23.08	25.14	28.31	33.16	28.00	27.15	22.38	31.14
C18:2	49.52	45.57	50.10	44.48	43.16	42.18	44.13	48.51
C18:3	3.33	4.11	12.05	4.48	2.18	5.58	7.49	8.18

*** the values are expressed on a dry matter basis.**

Statistical Analysis:

The differences among treatments were performed using one-way ANOVA design using SPSS Statistics (SPSS, 2008). One-way ANOVA was used to show the effects of feed additives (Scc, Asp and Lac and their combinations). Tukey`s multiple comparison test was used to identify which treatments were significantly different from each other at a significance level of P<0.05.

RESULTS AND DISCUSSION

Egg Quality traits:

The effect of dietary supplementation with Scc, Asp, Lac and the mixtures of these three types on egg quality of Gimmizah laying hens are shown in Table (3). Differences in yolk and shell weights or the heights of albumen and yolk among the treatment groups were not significant. However, egg weight, albumen weight and egg yolk color score synergistically increased by feeding a diet containing a combination of Scc, Asp and Lac. As a result of the probiotic supplementation observed in this study. The improvement in egg quality is mainly reflected by the increase in egg weight. Similar results were reported in hens by Davis and Anderson (2002) and Kalavathy *et al*. (2009). Also, dietary feed live Lactobacillus acidophilus culture significantly (P<0.05) increased egg production (Miles *et al*., 1981). Inclusion of probiotics insignificantly effect on egg weight (Mohan *et al*., 1995; Haddadin *et al*., 1996; Chen and Chen, 2003). Also, many reports which have different results (Tortuero and Fernandez, 1995), this difference might be linked to type and strain of probiotics used, or level and form of bacteria used such as viability and dryness of their products. The same authors reported that, supplementation of vital biomass of probiotic significantly affected on egg weight. Also, Nancy Shearan *et al.*, (2017) reported that, probiotic and prebiotic supplementation to layers diet had significant increase in egg weight.

Table 3. Effects of single and combined supplementation of Sccharomyces cerevisiae (Scc) Aspergillus awamori (Asp) and lactic acid bacteria (Lac) in laying hen diets on egg quality of Gimmizah chickens.

Treatment	Egg weight (g)	Shell weight (g)	Yolk weight (g)	Albumen weight mm	Albumen height (mm)	Yolk height (mm)	Yolk color score
Control	52.33±1.47[b]	8.35±0.84	18.01±0.42	25.97±1.05[b]	7.98±0.74	19.07±1.13	7.07±0.54[b]
Scc	53.20 ± 0.69[a]	8.43 ± 1.39	16.97 ± 0.68	27.80 ± 1.11[a]	7.94 ± 0.67	19.82 ± 0.46	7.50 ± 0.67[a]
Asp	55.67 ± 1.28[a]	8.23 ± 1.00	17.52 ± 0.45	29.92 ± 0.90[a]	7.11 ± 0.52	20.40 ± 0.31	7.60 ± 0.45[a]
Lac	55.75 ± 1.63[a]	7.90 ± 0.79	17.73 ± 0.89	30.12 ± 1.16[a]	7.82 ± 0.22	19.45 ± 0.36	7.57 ± 0.91[a]
Scc×Asp	56.33 ± 1.85[a]	8.30 ± 1.18	18.70 ± 0.71	29.33 ± 1.02[a]	7.26 ± 0.35	20.27 ± 0.63	7.53 ±0.80[a]
Asp× Lac	56.55 ±1.62[a]	8.90 ± 0.36	18.43 ± 0.78	29.22 ± 0.93[a]	7.54 ± 0.29	19.35 ± 0.68	7.63 ± 0.61[ab]
Scc× Lac	55.82 ± 1.53[a]	8.45 ± 0.56	18.82 ± 0.20	28.55 ± 1.50[a]	7.62 ± 0.50	20.17 ± 0.42	7.67 ± 0.80[ab]
Scc×Asp×Lac	56.63 ± 0.97[a]	8.84 ± 1.15	18.01 ± 0.56	29.78 ± 4.58[a]	7.72 ± 0.21	20.00 ± 0.25	7.83 ± 0.70[a]
Sig	*	NS	NS	*	NS	NS	*

Scc, Asp and Lac were added to the basal diet at levels of 0.1%, 0.05% and 0.10%, respectively. a and b Means within the same column with different superscripts are significantly different at P<0.05. NS: not significant (P>.05). * Significant at P<0.05.

The addition of biological additives did not significantly affect the egg weight (Nahashon *et al*., 1996; Haddadin *et al*., 1996). These controversial results might be related to the probiotic dose and bacteria concentration used in diet (Saleh *et al*., 2017).

On the other side, probiotic supplemented had no significant effect on yolk weight and yolk and albumen heights. This response was predictable which has already been reported by Haddadin *et al*. (1996) and Chen and Chen (2003). On the other hand, Jensen *et al*. (1978) showed significant enhancements in interior egg quality which measured using Haugh Units in hen fed diets containing corn fermentation soluble.

Blood parameters:

Data presented in Table (4) introduce the effect of adding Scc, Asp, Lac and their mixtures to the diet on some blood plasma parameters. Plasma glucose, triglycerides, total cholesterol and LDL were decreased by feeding combination of Asp and Lac. Activity of plasma transaminases (AST and ALT) significantly decreased in hens fed diet had Scc and Asp. However, all treatment groups had elevated HDL concentration compared with control group. Feeding a diet including probiotic has a negative effect on triglycerides and total cholesterol in blood plasma of chickens (Mohan *et al*., 1995; Saleh, 2014; Saleh *et al*., 2011, 2017).

Table 4. Effects of single and combined supplementation of Sccharomyces cerevisiae (Scc) Aspergillus awamori (Asp) and lactic acid bacteria (Lac) in laying hen diets on some blood plasma variables of Gimmizah chickens.

Treatment	Triglyceride (mg/dL)	Total cholesterol (mg/dL)	LDL (mg/dL)	HDL (mg/dL)	Glucose (mg/dL)	AST (U/L)	ALT (U/L)
Control	94.60 ± 0.45[a]	90.00 ± 0.92[a]	47.15 ± 0.1.40[a]	23.93 ± 0.47[d]	210±7.63[c]	48.33±1.37[d]	24.03±0.86[d]
Scc	81.13 ± 0.52[b]	76.36 ± 0.55[c]	31.43± 0.76[b]	28.70 ± 0.35[c]	271±2.91[a]	55.33±1.33[bc]	29.17±0.67[b]
Asp	67.10 ± 0.58[c]	63.40 ± 0.87[d]	20.78 ±0.1.40[d]	29.20 ± 0.72[bc]	236±7.18[b]	58.27±2.19[ab]	29.73±0.83[b]
Lac	66.70 ± 0.25[c]	62.73 ± 0.75[d]	23.73 ± 1.00[d]	25.67 ± 0.32[d]	261±2.73[a]	57.37±1.70[ab]	30.23±0.37[b]
Scc×Asp	64.67 ± 0.20[d]	61.20 ± 1.18[d]	15.54 ± 1.14[e]	32.73 ± 1.51[a]	258±7.81[a]	37.47±0.81[e]	22.83±0.28[d]
Asp× Lac	53.70± 0.91[e]	56.70 ± 1.82[e]	14.16 ± 0.97[e]	31.80 ± 0.92[a]	212±1.57[c]	51.83±1.01[cd]	26.90±0.26[c]
Scc× Lac	67.33 ± 1.23[c]	73.50 ± 0.93[c]	27.53 ± 1.37[c]	32.50 ± 0.52[a]	264±3.48[a]	56.37±2.00[abc]	29.83±0.38[b]
Scc×Asp×Lac	82.50 ± 0.47[b]	80.17 ± 0.15[b]	32.30 ± 0.35[b]	31.37 ± 0.33[ab]	242±2.02[b]	60.57±0.84[a]	31.87±0.12[a]
Sig	**	**	**	**	**	**	**

Scc, Asp and Lac were added to the basal diet at levels of 0.1%, 0.05% and 0.10%, respectively. a, b and c: Means within the same column with different superscripts are significantly different at P<0.05. NS: not significant. **: significant at P<0.01.

Also, probiotic supplementation (bacteria) led to reduction in serum total cholesterol levels from 176.5 to 114.3 mg/dl in White Leghorn layers (Mohan *et al*., 1995). Hajjaj *et al*., (2005) showed that potential mechanism cholesterol-lowering action of Aspergillus Oryzae could be due to the inhibition of the activity of the 3-hydroxyl-3methylglutaryl-coenzyme (HMG-CoA) reductase, which is rate-limiting enzyme pathway of cholesterol biosynthesis. The HMG-CoA reductase inhibitor produced by Aspergillus spp. might be responsible for the reduced in abdominal fat deposition. This inhibitor might affect fat deposition by influencing the activity of hormone-sensitive lipase and malate dehydrogenase enzyme in adipose tissues (Mersmann, 1998). In addition as reported by Klaver and Van Der Meer, (1993). Mechanism through which probiotic culture can exert its hypocholesterolemic action is via bile acids. Cholic and Deoxycholic bile acids are produced from cholesterol by hepatocytes and are conjugated with taurine, respectively. These bile acids enter the small intestine, where they are absorbed and directed to the bird liver, and a decrease in bile acid recycling would ultimately result in lowering serum cholesterol concentrations because cholesterol is used for bile acid synthesis (St-Onge *et al.*, 2000). Many research findings also reported that, supplementation of Probiotics had significant reduction on serum cholesterol level (Chitra *et al*., 2004; Mahdavi *et al.*, 2005 and Cenesz *et al.*, 2008). On the same hand, results of Shirley Gee *et al.*,(2017) indicated that, supplementation of prebiotic IMO (produced by the enzymatic conversion of starch), probiotic (a mixture of lactobacillus acidophilus, lactobacillus casei, Bifidobacterium bifidum, Streptococus faecium and Aspergillus oryzae or a combination of them decreased plasma total cholesterol, LDL and ALT at 36 and 52 weeks of age.

Egg yolk fatty acid profile:

The effects of feeding Scc , Asp or Lac and their combinations on the egg yolk fatty acid profile in laying hens are presented in Table (5). Egg yolk content of myristic, palmitic and stearic acids were decreased by feeding Scc or Asp or Lac and their combination. On the other hand, the content of palmitoleic acid and α-linolic acid in the egg yolk were increased by feeding the combination of Asp and Lac. Oleic acid and arachidonic acid were increased by feeding a diet having Scc compared to the control group. In addition, Linolic acid was increased by feeding a diet having the three additives (Scc, Asp and Lac), compared to other treatments applied or control group. As a result, saturated fatty acids (SFA) were reduced due to feeding the experimental diets . Some studies have shown that different types of probiotics produce oleic acid (n-9) and linoleic acid (n-6) which are the most common unsaturated fatty acids. In this regared, linoleic acid is a main component of fungal and bacteria lipid. (Mazur *et al*., 1991; Calvo *et al.*, 2001; Wilson *et al*., 2004; Tsitsigiannis *et al*., 2004). Therefore, the increase in oleic, linoleic and α-linolenic acid in the egg yolk may be due to the intestinal activitiy of Aspergillus spp and Lactobacillus. This can also mean that Asp. produces a desaturase that can change saturated fatty acid to unsaturated fatty acids (Wilson *et al*., 2004; Saleh, 2014; Saleh *et al*., 2013; 2017).

Table 5. Effects of single and combined supplementation of Sccharomyces cerevisiae (Scc) Aspergillus awamori (Asp) and lactic acid bacteria (Lac) in laying hen diets on fatty acid methyl esters (FAME) content in egg yolk (% of total fatty acid content) of Gimmiza chickens.

Treatment	C14:0	C16:0	C18:0	C16:1	C18:1	C18:2	C18:3	C20:4	TSFA	TUSFA	TSFA/ TUSFA	TPUSFA
Cont	2.3 ± 0.06^{a}	28.7 ± 0.05^{a}	11.7 ± 0.06^{a}	4.5 ± 0.06^{b}	42.6 ± 0.06^{d}	5.37 ± 0.19^{f}	4.2 ± 0.06^{f}	0.4 ± 0.06^{de}	42.7± 0.06^{a}	57.3± 0.06^{f}	0.74± 0.002^{a}	4.83 ± 0.07^{f}
Scc	2.0 ± 0.06^{e}	23.3 ± 0.05^{f}	10.7 ± 0.06^{c}	3.8 ± 0.06^{c}	44.5 ± 0.06^{a}	6.40 ± 0.06^{d}	7.8 ± 0.06^{de}	2.2 ± 0.06^{a}	34.2± 0.06^{d}	65.8± 0.06^{c}	0.52± 0.001^{d}	11.10 ± 0.15^{b}
Asp	0.30 ± 0.06^{de}	22.9 ± 0.05^{g}	8.9 ± 0.06^{g}	3.2 ± 0.11^{d}	42.9 ± 0.06^{c}	7.40 ± 0.06^{c}	9.0 ± 0.06^{b}	1.9 ± 0.06^{b}	32.1± 0.06^{f}	67.9± 0.06^{a}	0.47± 0.001^{f}	14.40 ± 0.06^{a}
Lac	0.30 ± 0.06^{de}	25.2 ± 0.05^{c}	9.3 ± 0.06^{f}	4.5 ± 0.05^{b}	42.2 ± 0.00^{f}	7.83 ± 0.07^{b}	7.6 ± 0.06^{e}	1.83 ± 0.09^{b}	34.80± 0.15^{c}	65.2± 0.15^{d}	0.53± 0.004^{c}	10.67 ± 0.15^{c}
Scc×Asp	0.40 ± 0.06^{d}	23.6 ± 0.05^{e}	11.0 ± 0.12^{b}	3.7 ± 0.05^{c}	43.4 ± 0.06^{d}	8.40 ± 0.06^{a}	8.0 ± 0.06^{d}	0.37 ± 0.09^{e}	35.0± 0.0^{c}	65.0± 0.0^{d}	0.54± 0.001^{c}	9.50 ± 0.06^{e}
Asp× Lac	1.20 ± 0.06^{b}	22.9 ± 0.05^{g}	9.6 ± 0.06^{e}	4.8 ± 0.05^{a}	42.4 ± 0.06^{b}	7.76 ± 0.09^{b}	9.9 ± 0.06^{a}	0.60 ± 0.06^{d}	33.7± 0.12^{e}	66.3± 0.12^{b}	0.51± 0.003^{e}	11.33 ± 0.09^{b}
Scc× Lac	1.30 ± 0.06^{b}	25.4 ± 0.05^{b}	10.8 ± 0.06^{bc}	4.5 ± 0.05^{b}	41.8 ± 0.09^{g}	5.96 ± 0.09^{e}	8.6 ± 0.22^{c}	0.57 ± 0.07^{de}	37.5± 0.06^{b}	62.5± 0.06^{e}	0.60± 0.001^{b}	10.17 ± 0.9^{d}
Scc×Asp×Lac	1.00 ± 0.06^{c}	23.9 ± 0.03^{d}	9.9 ± 0.09^{d}	3.2 ± 0.09^{d}	42.8 ± 0.06^{c}	8.60 ± 0.06^{a}	7.8 ± 0.06^{de}	0.83 ± 0.03^{c}	34.8± 0.18^{c}	65.1± 0.18^{d}	0.54± 0.004^{c}	10.47 ± 0.03^{cd}
Sig	**	*	NS	NS	**	*	**	**	**	**	**	**

Scc, Asp and Lac were added to the basal diet at levels of 0.1%, 0.05% and 0.10%, respectively. a, b and c: Means within the same column with different superscripts are significantly different at P<0.05. NS: not significant. * significant at P<0.05 **: significant at P<0.01.

C14:0 (Myristic), C16: 0 (Palmitic), C18: 0 (Stearic), C16:1(Palmitoleic), C18: 1 (Oleic), C18: 2(Linoleic), C18: 3 (α-Linolenic) and C20: 4 (Arachidonic acid).

CONCLUSION

The diet supplemented with Saccharomyces cerevisiae, Aspergillus awamori and Lactic acid bacteria as probiotics have a potential for improving egg quality and the fatty acid profile in egg yolk as well as to the plasma lipid profile in laying hens.

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تأثير إضافة محفزات النمو في علائق الدجاج البياض على تحسين محتوى صفار البيضة من الأحماض الدهنية الغير مشبعة

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أجريت هذه الدراسة لبحث تأثير إضافة كلا من Scc و Asp و Lac والمخاليط بينهم في علائق الدجاج البياض على جودة البيضة والدهون في بلازما الدم والأحماض الدهنية في صفار البيضة .استخدم في هذا البحث ٩٦ دجاجة عمر ٢٨ أسبوع قسمت إلى ٨ مجموعات (١٢ دجاجة/ مجموعة) كما يلي:المجموعة الأولى غذيت على عليقة إنتاجية بدون اى إضافات (عليقة المقارنة). المجموعة الثانية غذيت على عليقة المقارنة مضافا إليها ١٠, % Scc المجموعة الثالثة غذيت على عليقة المقارنة مضافا إليها ٠٥, % Asp. المجموعة الرابعة غذيت على عليقة المقارنة مضافا إليها ١٠,% Lac. المجموعة الخامسة غذيت على عليقة المقارنة مضافا إليها مخلوط من Scc و Asp . المجموعة السادسة غذيت على عليقة المقارنة مضافا إليها مخلوط من Scc و Lac .المجموعة السابعة غذيت على عليقة المقارنة مضافا إليها مخلوط من Lac و Asp. المجموعة الثامنة غذيت على عليقة المقارنة مضافا إليها مخلوط من Scc و Asp و Lac .وقد استمرت الدراسة لمدة ١٦ أسبوع وجاءت النتائج كما يلي :أدى إضافة محفزات النمو أو مخاليطها إلي زيادة معنوية في وزن البيضة والبياض ولون الصفار مقارنة بمجموعة المقارنة.لم يتأثر وزن القشرة او الصفار وكذا ارتفاع كل من الصفار أو البياض بإضافة محفزات النمو.انخفض الكولسترول الكلى والجليسريدات الثلاثية و LDL انخفاضا معنويا في بلازما الدم فى المجموعة السابعة مقارنة بباقي المجموعات ومجموعة المقارنة. زاد مستوى HDL معنويا في بلازما الدم في جميع المعاملات مقارنة بمجموعة المقارنة .انخفض مستوى الاحماض الدهنية المشبعة بينما ارتفع مستوى الاحماض الدهنية الغير مشبعة فى صفار البيضة معنويا فى جميع المعاملات مقارنة بمجموعة المقارنة.وقد خلصت هذه الدراسة إلى :أن إضافة Scc أو Asp أو Lac أو مخاليطها كمحفزات نمو في علائق الدجاج البياض يمكن أن يحسن جودة البيضة ويعدل من تركيب الأحماض الدهنية بزيادة الأحماض الدهنية الغير مشبعة وتقليل الأحماض الدهنية المشبعة .