EFFECT OF DIFFERENT LEVELS OF LACTOBACILLUS AND BIOGEN ON PRODUCTIVE PERFORMANCE OF LOCAL STRAIN

By

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Abstract: *The object of this study was to evaluate the effect of graded levels of Lactobacillus Acidophilus and Biogen supplementation as natural feed additives on layer hen performance. Two hundred and forty pullets and twenty four cockerels of Gimmizah strain (20 wks) were randomly distributed to eight treatments, each containing 30 pullets and 3 cockerels in 3 replicates. The supplementation levels of Lactobacillus Acidophilus and Biogen were 0.25, 0.50 and 0.75 g /kg diet and 0.50, 1.00, 1.50 and 2.00 g /kg diet, respectively. Birds were reared in floored cages in an open system house under similar conditions of management up to 36 wks of age.*

The results showed that increasing supplementation levels of Lactobacillus and Biogen significantly (P< 0.01) affect on egg production and the best egg production (0.62/ hen/ day)was recorded for hens fed diet supplemented with 0.75 g Lactobacillus/kg for the overall mean as compare to control (0.53egg/hen/day), respectively. Increasing Lactobacillus and Biogen levels increased significantly (P< 0.01) the egg weight and egg mass. Generally, the greatest egg weight((46.2 and 46.5 g/hen) was recorded for layers fed diet supplemented with 0.5 g Lactobacillus /kg diet and 1.0 g Biogen /kg , while the greatest egg mass (29.7 g/hen/day) was recorded for layers fed diet supplemented with 0.75 g Lactobacillus /kg diet, for the whole of experimental period. Supplementation of Lactobacillus or Biogen significant (P< 0.01) affected on feed conversion ratio (FC) for the whole experimental period. The best FC (3.92) was observed of hens fed diet supplemented with 0.75 g Lactobacillus /kg diet, and the best FC (4.09) was observed of hens fed diet supplemented with 1.50 g Biogen/kg diet as compeer to control. Plasma albumin concentration was not affected significantly by level of Lactobacillus or Biogen supplementation. Plasma globulin concentration was increased significantly with increasing level of Lactobacillus or Biogen supplementation. Plasma total lipids and cholesterol concentration decreased significantly with increasing level of Lactobacillus *or Biogen supplementation. There were no significant differences among treatments in most egg quality traits except Haugh units. Layers fed basal dies supplemented with 0.5 g Lactobacillus/kg or with 1.50 g Biogen /kg exhibited the best relative economical efficiency.*

In conclusion, Lactobacillus Acidophilus at 0.5 g/kg diet or Biogen at 1.50 g/kg diet improved economic efficiency and performance of Gimmizah layers hens.

INTRODUCTION

The developing resistant populations of bacteria and the side effects of using antibiotics as growth promoters in farm animals, has led to use several natural growth promoter or feed additives and living microorganisms on poultry diets to stimulate a more effective use of feed nutrients, increased the performance and immunity (Boulos *et al.*, 1992; Dorgham *et al.*, 1994; Abdel –Malak *et al.*, 1995 and Soliman *et al.*, 1999, Huang *et al.*, 2004).

Manufacturers producing microorganisms (probiotics) commercially as growth promotion substitute for antibiotics in animal feed to avoid its hurtful on human health. The use of living microorganisms as probiotics has recommended as an alternative to antibiotics as prophylactic, therapeutic and growth–promoting agents in livestock production (Smoragiewicz *et al.*, 1993; Gournier – Chateau *et al.*, 1994). Lactobacillus Acidophilus improved egg production (Mohan *et al.*, 1995, Abdulrahim *et al.*, 1996, Haddain *et al.*, 1996, Siam *et al.*,2004), feed conversion (Mohan etal., 1995; Abdulrahim *et al*, 1996; Jin *et al.*, 1998 and Haddain *et al.*, 1996), significantly reduced serum cholesterol concentrations (Mohan *et al.*, 1995; Abdulrahim *et al.*, 1996; Haddanin *et al.*, 1996, Jin *et al.*, 1998, Abdel Azeem *et al.*, 2001, Siam *et al.*,2004), improved egg shell quality (Mohan *et al.*, 1995 and Haddain *et al.*,1996), improved nutrient digestibility (Abdel Azeem *et al.*, 2001, Mater and Corthier, 2004), while had no significant effect on the concentration of total lipids or triglycerides (Abdulrahim *et al.*, 1996). Huang *et al.* (2004) indicate that *Lactobacillus Acidophilus* supplementation was able to enhance production performance of broiler chickens. Torres-Rodriguez *et al.* (2007) reported that commercial Lactobacillus-based probiotic significantly improved market body weight, average daily gain, not affected on feed conversion ratio and reduced cost of commercial turkey hen production.

Biogen is a natural extract based primarily on garlic, usage as a natural feed additive. The main component of it is Allicin + Germanium (is extracted from Ginseng) + high-unit hydrolytic enzyme (Amylolytic + Lipolytic +propteolytic + cell separating enzymes). Lun *et al.* (1994) and Angelo *et al.*

(1998) stated that Allicin (as garlic extract) can used for treatment of bacterial, fungal and parasitic infections. Garlic (*Allium Sativum L.*) is considered as antiatheroscletic agents because it has hypo-lipemic and hypo-cholesterolemic properties (El-Nawawy, 1991 and Mohamed *et al.*, 2000), antimicrobial (Mesbah and Abou El-Ela, 1991). Yang and Yu (1990) reported that Ginseng promotes the phagocyte activity and inhibits the growth of tumor cell. Garlic powder reduced cholesterol levels of plasma and eggs of layer hens (Mohamed *et al.*, 2000, Soliman and Abdou, 2005). Also, the same reduction was observed in Japanese quail eggs (El-Habbak *et al.*, 1989). Garlic powder increased egg production of layers (Mohamed *et al.*, 2000 and Soliman and Abdou, 2005), while it is depressed in Japanese quail (El-Habbak *et al.*, 1989).

Qota *et al.* (2002) indicated that Biogen addition to diet containing 10% soaked linseed cake slightly improved broiler growth. Osman *et al.* (2002) indicated that addition of 1.0 g Biogen/ kg diet had numerically higher broiler body weight gain. Abdalla *et al.* (2004) reported that duck diet supplemented by Biogen improved significantly body weight, body weight gain, feed conversion, performance index and economic efficiency. Soliman and Abdou (2005) indicated that addition of fresh garlic had no significant effect on egg quality, except yolk color, Haug unit score and yolk index. Safaa, (2007) concluded that dietary garlic at 2% level reduces serum and egg yolk cholesterol, serum LDL-cholesterol concentrations and increase serum HDL-cholesterol in laying hens without affecting on hen productivity or egg quality. Khalil *et al.* (2007) indicated that 1.6 % of dried garlic can be used as feed additive improve the productive performance, immunity and economic efficiency in growing Japanese quail under hot climate conditions. El-Kaiaty *et al.* (2002) indicated that feeding White Bovans laying hens 2% garlic from 30 to 38 wks of age decreased significantly serum cholesterol by 18 % and egg yolk cholesterol by 20%. Kamal and Daoud (2003), Mottaghitalab and Taraz (2004) and Samar *et al.*, (2005) found that dried and fresh garlic causes a reduction in total lipids, cholesterol and triglycerides.

The aim of the present experiment was to study the effects of two probiotics (Lactobacillus Acidophilus and Biogen) on performance, economical efficiency and some blood constituents of Gimmizah laying hens.

MATERIALS AND METHODS

The present study was carried out at El-Sabahiah Poultry Research Station, Animal Production Research Institute, Agriculture Research Center. Two hundred and forty pullets and twenty four cockerels of Gimmizah strain aged 20 wks were randomly distributed to eight treatments (each consists of three replicates with 10 pullets and one cockerel). Birds were reared on floor under similar environmental condition from 20 wks to 36 wks of age (end of experiment). Throughout the experimental period, the first treatment was used as control group (fed basal diet without any additives). The second three treatments were fed basal diet with three levels of *Lactobacillus Acidophilus* (0.8 Billion CFU/g), (0.25, 0.50, 0.75 g/kg basal diet). The last four treatments were fed basal diet with four levels of Biogen (0.5, 1.0, 1.5, 2.0 g/kg basal diet) Table 1. Water and feed were provided *ad-labitum*. Body weight (BW) was recorded at the beginning (20 wks of age) and later 4 wks intervals throughout the whole experimental period. Feed intake (FI), feed conversion (FC), egg production (EP), egg weight (EW) and egg mass (EM) were recorded and calculated at the end of each 4-wk intervals. At the end of the experimental period (36 wks of age), some external and internal egg quality were measured.

Blood samples were collected from six hens of each treatment at the end of experimental, centrifuged at 3500 rpm for 15 minutes and stored at -20 ^{0}C for analyses. Plasma total protein, albumin, total lipids and cholesterol were calorimetrically determined using commercial kits, following the same steps as described by manufactures. Globulin values were obtained by subtracting the values of albumin from the corresponding values of total protein.

The total feed cost (L.E/hen) at the end of the experiment for each treatment, was calculated depending upon the local market prices of the ingredients used for formulating the experimental diet, price of Lactobacillus (36 LE /kg), price of Biogen (30 LE/kg). Also, the total income (L.E/hen) was calculated depending upon the market price of the suitable egg (0.45 LE/one egg). Economical efficiency (EE) and relative economic efficiency (REE) were calculated according to input-output analysis.

Data were statistically analyzed using the General Linear Models by one way ANOVA using the procedure (SAS®, 1998). When a significant F value was detected, mean differences were compared using Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Productive Performance:-

Results presented in Table 2 indicated that supplementation Lactobacillus or Biogen at any level had significant ($p< 0.01$) effect on the egg production (egg/hen/day) throughout the experimental periods (24-28, 28-32 and 32-36 wks and for whole experimental period).

Therese wets indicated that the test egg production (0.80 99/ hen/ day) was recorded for the hens led 0.75g lacto bacillus/ kg diet and 1.00, Biogem through 32-36 wks of age. On the other hand, the best egg production (0.62 egg/ hen/ day) was recorded for the hens led 0.75, lacto bacillus/ kg diet through the whole experimental period.

Our results are in line with the results of Mohan *et al.* (1995), Abdulrahim *et al.* (1996), Haddain *et al.* (1996) and Siam *et al.* (2004) they reported that Lactobacillus acidophilus improved egg production. Also, Mohamed *et al.* (2000), Soliman and Abdou (2005) and Safaa (2007) reported that garlic powder increased egg production of laying hens.

Egg weight (EW) was significantly ($p<0.01$) affected by Lactobacillus or Biogen supplementation through whole experimental periods, Table (3). However, the results indicated that increasing level of Lactobacillus supplementation increased significantly ($P< 0.01$) the EW as compared to control. The greatest increase in EW (48.2 g/hen) was recorded with 0.5 and 0.75 g Lactobacillus/kg diet, during 32-36 wks and (46.2 g/hen) with 0.5 g Lactobacillus/kg for the overall mean of the whole experimental period. Many investigators reported that supplementation layer diet with Lactobacillus improved EW (Nahashon *et al.*, 1996; Haddain *et al.*, 1996 and Siam *et al.*, 2004). Also, the results indicated that the increasing level of Biogen supplementation increased significantly ($P< 0.01$) the EW through 32-36 wks as compared to control, since the layer fed diet supplemented by 2.0 g Biogen /kg had the greatest EW (48.4 g/hen). While, supplementation 1.0 g Biogen /kg diet recorded the best EW (46.5 g/hen) for the overall mean, as compared to control. Soliman and Abdou (2005) and Safaa (2007) indicated that addition of fresh garlic improved EW.

Results of (EM), Table 4, indicated the same trend of EW results. Since, Lactobacillus supplementation had significant ($P< 0.01$) effect throughout the whole experimental period. In general, the layers fed diet supplemented 0.5 and 0.75 g Lactobacillus /kg, recorded the greatest EM through 32-36 wks and for the overall mean. Biogen supplementation at 1.0 g /kg diet had the best significant ($P\leq 0.01$) EM through 28-32, 32-36 wks and for the overall mean, as compared to control. Nahashon *et al.* (1996), Haddain *et al.* (1996), Siam *et al.* (2004) and Safaa (2007) reported that supplemented with Lactobacillus improved layer egg mass.

The amount of (FI) was significantly ($p<0.01$) affected by Lactobacillus or Biogen supplementation, Table (5). The lowest amount of FI (101.9, 94.5, 107.3 and 101.3 g/hen/day) was recorded for the layers fed 1.5 g Biogen/kg diet throughout the experimental periods 24-28, 28-32, 32-

36 wks and for the overall mean of the experiment, respectively, as compared to control. Feed conversion ratio (FC), Table 6, had been significant (P<0.01) affected by supplementation of Lactobacillus or Biogen in layer diets throughout the experimental periods. Increasing supplementation levels of Lactobacillus in layer diets improve significant FC (P< 0.01). Increasing supplementation levels of Lactobacillus in layer diets improve significant (P<0.01) the overall mean of FC through the experimental period, compared to control, and the best overall mean of FC (3.92) had been recorded for the level 0.75 g/kg Lactobacillus. Also, increasing Biogen supplementation to 1.5g/kg layer diets improve significant (P< 0.01) the overall mean of FC (4.09), while it reversed for high supplementation 2.0g/kg diet as compared to control. Mohan *et al.* (1995), Abdulrahim *et al* (1996), Jin *et al.* (1998), Haddain *et al.* (1996), and Huang *et al.* (2004) reported that Lactobacillus acidophilus improved food conversion ratio. While Torres-Rodriguez *et al.* (2007) reported that Lactobacillus had not affected on feed conversion ratio. Soliman and Abdou (2005) indicated that addition of fresh garlic improved feed conversion for layers. Abdalla *et al.* (2004) reported that Biogen supplementation to duck diets improved significantly feed conversion. Khalil *et al.* (2007) indicated that 1.6 % of dried garlic improve the productive performance in growing Japanese quail under hot climate conditions.

The improvement of EP, EW and EM may be attributed to using Lactobacillus or Biogen as natural probiotic which modifying the intestinal flora, especially gram-positive bacteria, which are associated with poorer health. Also, they enhance the production performance of poultry through improve nutrient availability and absorption. Probiotic produce lactic acid which alter the pH of chicken gut making it improper media for harmful bacteria such as salmonella and pathogenic species of E.coli (Leesson and Major,1990), stimulate appetite (Nahashon *et al*, 1994), produce digestive enzymes (Lee and Lee, 1990), improve intestinal microbial balance (Fuller, 1989), and improve nutrient availability and absorption (Sellars, 1991). Sellars (1991) suggested that presence of high number of Lactobacilli might increase the motility of improve nutrient availability and absorption. Mater and Corthier (2004) suggest that lactic acid bacteria are metabolically active in the digestive tract and can synthesize proteins to adapt to the digestive environment. Patterson and Burkholder (2003) found that probiotic enable the host animal to return to normal through competition for substrates, production of toxic compounds that inhibit pathogens, and competition for attachment sites. Lun *et al.* (1994) and Angelo *et al.* (1998) stated that Allicin (as garlic extract) can used for treatment of bacterial, fungal and parasitic infections.

Physiological Parameters:

Results in Table 7 show that plasma total protein was significantly affected by Lactobacillus and Biogen supplementation, and the highest concentration (6.57 and 5.99 g/dl) was recorded for the layers fed basal diet supplemented with the highest levels of Biogen(1.5 and 2.0 g/kg diet). Plasma albumin concentration was not differ significantly by any supplementation levels of Lactobacillus or Biogen to layer diets, as compared to control. Globulin concentration was increased significantly by increasing supplementation levels of Lactobacillus and Biogen. The percentages of plasma globulin increasing was 26.37 and 28.7 % for 0.50 and 0.75 g Lactobacillus/kg, respectively and 56.59 and 34.62 % for 1.50 and 2.00 g Biogen /kg supplementation, respectively, as compared to control. That increase of plasma globulin concentration its may be reflected the enhance effect of bird immunity system. Garlic (*Allium Sativum L.*) is considered as antimicrobial (Mesbah and Abou El-Ela, 1991). Yang and Yu (1990) reported that Ginsenoside promotes the phagocyte activity and inhibits the growth of tumor cell.

Results of plasma total lipids and cholesterol concentration Table 7 were significantly (P< 0.01) decreased by increasing supplementation levels of Lactobacillus or Biogen in layer diets, as compared to control. The plasma total lipids and cholesterol reduction percentage ranged between 55.72 to 55.75% and 62.50 to 62.59 % for supplementation 0.50 and 0.75 g Lactobacillus /kg diet, respectively and between 53.19 to 50.07% and 66.28 to 65.56 % for supplementation 1.50 and 2.00 g Biogen /kg diet, respectively. The decrease in cholesterol and total lipids in plasma may reflect the rate of their absorption through the intestinal gut with feeding probiotics. These finding agree with the results of Tortuero *et al,* (1975) who reported that, intestinal flora may assimilate or degrade the cholesterol to bile acids followed by deconjugation to prevent resynthesis. Haddain *et al.* (1996) and Siam *et al.* (2004) attributed this reduction to decrease in absorption and/or synthesis of cholesterol in the gastro-intestinal tract with Lactobacillus supplementation. Also, garlic was very effective in lowering the total lipids in chickens (Qureshi *et al.*, 1983). Garlic powder reduced cholesterol levels of plasma and layer eggs (Mohamed *et al.*, 2000; Soliman and Abdou, 2005 and Safaa 2007). Kamal and Daoud (2003), Mottaghitalab and Taraz (2004) and Samar *et al.* (2005) found that dried and fresh garlic causes a reduction in total lipids, cholesterol and triglycerides.

Egg Quality:

Data for egg component, external and internal egg quality measured at the end of experimental period are presented in Table 8. Statistical analysis showed that differences among treatments were not significant in all parameters of egg quality except Haugh units. Increasing supplementation levels of Lactobacillus or Biogen in layer diets decreased significantly (P< 0.5) Haugh units, as compared to control. *Lactobacillus acidophilus* improved egg shell quality (Mohan *et al.*, 1995 and Haddain *et al.*, 1996). Soliman and Abdou (2005) indicated that addition of fresh garlic had no significant effect on egg quality, except yolk color, Haug unit score and yolk index. Safaa (2007) concluded that dietary garlic at 2% supplementation to laying diets had not been affected on egg quality.

Economic Efficiency:

The economical efficiency of dietary supplementation treatments are recorded in Table 9: Increasing Lactobacillus or Biogen supplementation levels increased the economical efficiency, since the layers fed basal dies with Lactobacillus supplementation at level 0.5 and 0.75 g/kg or with Biogen supplementation at level 0.5, 1.0 and 1.50 g/kg were superior for its relative economical efficiency than other levels of supplementation, as compared to control. Abdalla *et al.* (2004) reported that duck fed diet supplemented by Biogen improved its economic efficiency. Soliman and Abdou (2005) and Safaa (2007) indicated that addition of garlic improved economic efficiency.

CONCLUSION

It could be concluded that feed additives had accepted for a substance that enhance the production performance of poultry through improve nutrient availability and absorption. Overall conclusion of this experiment indicated that Lactobacillus and Biogen supplementation improved the layers performance and immunity. Supplementation layer diets with 0.5 Lactobacillus g/kg diet or 1.50 Biogen g/kg diet gave the best economical efficiency.

Table (1): Composition* and the nutritive value of the basal diets.

Feed stuffs	Kg	Energy and nutrient content	
Yellow corn (8.5%CP.)	630.0	ME (kcal/kg)	2728
Soybean meal (43% CP)	270.0	Crude protein (%calculated)	16.97
Di-Calciume phosphate	15.0	Ca %	3.0
Limestone	76.0	P % (available).	0.41
Premix**	3.0	Fiber (%)	2.88
Dl-Methionine	1.0	Ether extract (%)	2.70
NaCl	3.0	Methionine	0.35
Sand	2.0	TSAA (%)	0.64
Total	1000.0	Lysine	0.68

*As recommendation of Anim. Prod. Res. Inst., Agric Res. Center, Minis of Agric,

** Composition of premix in 3 kg is : Vit A 10,000,000 IU, Vit D_3 2,000,000; Vit E 10,000 mg, Vit K_3 1,000 mg, Vit B_1 1,000 mg, Vit B_2 4,000 mg, Vit B_6 1,500 mg, Vit B_{12} 10 mg; Niacin 20,000 mg; Pantotenic acid 10,000 mg, Folic acid 1,000 mg, Biotin 50 mg, Choline chloride 500, 000 mg, Cu 3,000 mg, Iodine 300 mg. Fe 30,000 mg; Mn 40,000 mg. Zn 45,000 mg, Selenium 100 mg.

Table (2): Effect of and Biogen supplementation on egg production (egg/hen/day) of Gimmizah layer hen during different periods of the experiment.

Feed Additive	Levels g/kg	Egg /hen/day			
		24-28 wks	28-32 wks	32-36 wks	Overall Mean
Control	0.00	0.30 ± 0.02^{d}	0.62 ± 0.04^{b}	0.68 ± 0.04^{bc}	0.53 ± 0.03^{bc}
Lactobacillus	0.25	0.35 ± 0.03^{bcd}	0.62 ± 0.04^{b}	0.69 ± 0.02^{abc}	0.55 ± 0.02^{bc}
	0.50	0.42 ± 0.03^{a}	0.68 ± 0.02^{a}	0.69 ± 0.03^{abc}	0.59 ± 0.04^{ab}
	0.75	0.38 ± 0.02^{abc}	0.62 ± 0.04^{a}	0.80 ± 0.02^{a}	0.62 ± 0.03^{a}
Biogen	0.50	0.33 ± 0.02^{cd}	0.69 ± 0.04^{a}	0.73 ± 0.04^{ab}	0.58 ± 0.03^{ab}
	1.00	0.35 ± 0.03^{bcd}	0.58 ± 0.04^{c}	0.80 ± 0.04^{a}	0.58 ± 0.03^{ab}
	1.50	0.40 ± 0.02^{ab}	0.58 ± 0.04^{c}	0.66 ± 0.03^{bc}	0.55 ± 0.03^{bc}
	2.00	0.31 ± 0.02^{d}	0.59 ± 0.04^{c}	0.61 ± 0.04^{c}	0.50 ± 0.03^{c}
Sig.		**	**	**	**

Means within the same column with different superscript are significantly different

** = Significantly at 0.01.

Table (3): Effect of and Biogen supplementation on egg weight (g/hen) of Gimmizah layer hen during different periods of the experiment

Feed Additive	Levels g/kg	Egg weight(g)			
		24-28 wks	28-32 wk	32-36 wks	Overall Mean
Control	0.00	45.2±0.24[cde]	45.2±0.67[ab]	47.0±0.04[bc]	45.6±0.19[c]
Lactobacillus	0.25	44.1 ±0.11[e]	43.9±0.35[d]	45.7±0.17[d]	44.6±0.06[d]
	0.50	45.9 ±0.01[ab]	44.5±0.46[bc]	48.2±0.09[a]	46.2±0.22[a]
	0.75	45.5 ±0.37[abc]	43.9±0.03[d]	48.2±0.25[a]	45.9±0.17[c]
Biogen	0.50	44.5±0.34[de]	43.1±0.44[e]	46.0±0.53[d]	44.5±0.25[e]
	1.00	46.1±0.10[a]	45.3±0.51[a]	47.9±0.67[b]	46.5±0.30[a]
	1.50	45.0±0.43[cd]	44.2±0.40[cd]	47.7±0.53[ab]	45.7±0.19[c]
	2.00	45.2±0.43[bc]	43.8±0.55[d]	48.4±0.57[a]	45.8±0.24[c]
Sig.		**	**	**	**

Means within the same column with different superscript are significantly different
** = Significantly at 0.01.

Table (4): Effect of and Biogen supplementation levels on egg mass (g/hen/day) of Gimmizah layer hen during different periods of the experiment

Feed Additive	Levels g/kg	Egg mass (g/hen/day)			
		24-28 wks	28-32 wks	32-36 wks	Overall Mean
Control	0.00	13.63±1.01[e]	30.70±1.24[bc]	25.49 ±1.61[bc]	24.67 ±1.28[bc]
Lactobacillus	0.25	15.33±1.42[cd]	30.42±0.39[bc]	25.24 ±1.65[c]	24.62 ±0.64[bc]
	0.50	18.17±1.37[a]	30.28±1.37[c]	28.86±2.04[ab]	27.67 ±1.59[ab]
	0.75	17.29±2.25[abc]	34.97±1.63[ab]	31.62 ±1.62[a]	29.71±1.64[a]
Biogen	0.50	14.41±1.10[de]	31.27±2.21[bc]	26.09±1.62[bc]	25.28±1.64[bc]
	1.00	15.91±1.70[bcd]	36.49±2.25[a]	27.60±2.37[bc]	26.76±2.29[ab]
	1.50	18.25±1.05[ab]	29.08±2.12[c]	26.54±2.25[bc]	25.42±2.27[bc]
	2.00	13.87±1.35[de]	26.87±2.71[c]	23.69±2.78[c]	22.43±2.61[c]
Sig.		**	**	**	**

Means within the same column with different superscript are significantly different
** = Significantly at 0.01.

Table (5): Effect of Lactobacillus Acidophilus and Biogen supplementation levels on feed intake (g/hen/day) of Gimmizah layer hen during different periods of the experiment

Feed Additive	Levels g/kg	Feed intake (g/hen/day)			
		24-28 Wks	28-32 wks	32-36 wks	Overall Mean
Control	0.00	129.2±6.15[a]	104.5±6.09[bc]	113.2±3.31[bcd]	115.6±2.53[b]
Lactobacillus	0.25	125.4±8.81[ab]	115.8±2.22[a]	126.4±4.83[a]	122.5±3.46[a]
	0.50	112.2±7.43[cd]	106.9±4.38[bc]	119.5±5.87[abc]	112.9±2.42[b]
	0.75	118.5±4.38[bcd]	113.1±5.04[ab]	122.9±3.29[ab]	118.2±1.82[ab]
Biogen	0.50	116.1±2.27[cd]	115.6±2.08[a]	109.5±3.29[cd]	113.7±1.81[b]
	1.00	114.7±4.81[cd]	112.2±6.29[ab]	115.4±6.51[abcd]	114.1±4.08[b]
	1.50	101.9±5.6[d]	94.5±7.03[c]	107.3±6.59[d]	101.3±4.83[c]
	2.00	112.7±2.66[cd]	111.4±6.82[abc]	111.4±3.58[bcd]	111.7±3.47[b]
Sig.		**	**	**	**

Means within the same column with different superscript are significantly different
** = Significantly at 0.01.

Table (6): Effect of Lactobacillus Acidophilus and Biogen supplementation levels on feed conversion of Gimmizah layer hen during different periods of the experiment

Feed Additive	Levels g/kg	Feed conversion			
		24-28 wks	28-32 wks	32-36 wks	Overall Mean
Control	0.00	9.51±0.25[a]	3.42±0.12[b]	4.48±0.15[ab]	4.71±0.13[abc]
Lactobacillus	0.25	8.29±0.62[ab]	3.82±0.11[ab]	5.01±0.19[a]	4.99±0.18[ab]
	0.50	5.99±0.98[bc]	3.54±0.07[b]	4.14±0.04[b]	4.13±0.20[cd]
	0.75	7.20±0.96[bc]	3.25±0.24[b]	3.88±0.16[b]	3.92±0.21[d]
Biogen	0.50	8.17±0.57[b]	3.76±0.24[ab]	4.23±.17[b]	4.55±0.21[abcd]
	1.00	7.57±1.15[b]	3.11±0.23[b]	4.33±0.55[ab]	4.41±0.44[bcd]
	1.50	5.64±0.44[c]	3.44±0.47[b]	4.10±0.29[b]	4.09±0.39[cd]
	2.00	8.29±0.61[ab]	4.44±0.49[a]	4.95±0.59[a]	5.19±0.49[a]
Sig.		**	**	**	**

Means within the same column with different superscript are significantly different
** = Significantly at 0.01.

Table (7): Effect of Lactobacillus Acidophilus and Biogen supplementation levels on Gimmizah blood parameters at the end of the experiment.

Feed Additive	levels g/kg	Total Protein (g/dl)	Albumin (g/dl)	Globulin (g/dl)	Globulin Reduction or Increasing%	Total lipids (mg/dl)	Total lipids Reduction or Increasing%	Total Cholesterol (mg/dl)	Total Cholesterol Reduction or Increasing%
Control	0.00	5.43 ± 0.41^{bc}	3.61 ± 0.27	1.82 ± 0.14^{c}	00.00	3177.3 ± 26.4^{a}	00.00	314.1 ± 27.9^{a}	00.00
Lacto.	0.25	5.23 ± 0.66^{c}	3.84 ± 0.42	1.80 ± 0.24^{c}	- 01.10	2925.9 ± 18.6^{a}	- 04.92	195.1 ± 14.9^{b}	- 37.89
	0.50	5.77 ± 0.87^{bc}	3.48 ± 0.50	2.30 ± 0.37^{b}	+ 26.37	1724.7 ± 86.9^{b}	- 55.72	117.8 ± 5.86^{c}	- 62.50
	0.75	5.85 ± 0.25^{bc}	3.51 ± 0.14	2.34 ± 0.11^{b}	+ 28.57	1723.7 ± 11.2^{b}	- 55.75	117.5 ± 2.50^{c}	- 62.59
Biogen	0.50	5.20 ± 0.53^{c}	3.60 ± 0.36	1.79 ± 0.17^{c}	- 01.65	2998.2 ± 46.1^{a}	- 05.64	290.8 ± 29.8^{a}	- 09.42
	1.00	5.43 ± 0.55^{bc}	3.72 ± 0.37	1.80 ± 0.18^{c}	- 01.10	2949.5 ± 37.7^{a}	- 07.17	307.9 ± 26.7^{a}	- 01.97
	1.50	6.57 ± 0.16^{a}	3.71 ± 0.11	2.85 ± 0.05^{a}	+ 56.59	1519.2 ± 49.9^{b}	- 53.19	105.9 ± 2.60^{c}	- 66.28
	2.00	5.99 ± 0.76^{ab}	3.55 ± 0.34	2.45 ± 0.42^{b}	+ 34.62	1567.8 ± 23.7^{b}	- 50.07	108.2 ± 16.9^{c}	- 65.55
Sig.		*	NS	**		**		**	

Means within the same column within different superscript are significantly different.
NS= No Significant * = Significantly at 0.05 ** = Significantly at 0.01

Table (8): Effect of Lactobacillus Acidophilus and Biogen supplementation levels on egg quality at the end of the experiment.

Feed Additives	Levels g/kg	Egg components: Shell Weight %	Egg components: Albumen Weight %	Egg components: Yolk Weight %	External quality: Egg Shape Index %	External quality: Shell Thickness (mm)	Internal quality: Yolk Index %	Internal quality: Haugh Units
Control	0.00	14.59±0.50	49.40 ±0.81	35.59±0.48	79.61±2.82	0.318±0.17	43.75±1.14	76.67±2.96^{a}
Lacto.	0.25	13.78±0.57	51.32 ±1.19	34.92±1.06	75.17±1.47	0.303±0.15	42.04±1.27	70.22±2.74^{ab}
	0.50	13.59±0.33	52.52 ±0.69	33.87±0.66	78.23±0.79	0.308±0.01	41.20±1.75	62.00±2.98^{c}
	0.75	13.53±0.22	52.01±4.56	33.36±1.59	80.07±2.53	0.307±0.10	41.01±1.62	68.97±3.28^{abc}
Biogen	0.50	16.04±0.53	51.48±2.51	33.69±1.42	76.68±1.07	0.314±0.12	40.51±0.52	72.09±2.57^{ab}
	1.00	13.77±0.31	53.91±1.16	33.59±0.79	80.01±2.52	0.316±0.01	41.66±1.49	65.62±4.24^{bc}
	1.50	13.75±0.74	53.44±1.98	32.91±1.60	76.97±1.11	0.308±0.10	41.08±1.42	69.75±1.92^{abc}
	2.00	14.37 ±0.27	53.78±0.97	31.80±1.05	77.31±1.29	0.313±0.01	40.95±1.01	72.15±2.03^{ab}
Sig.		NS	NS	NS	NS	NS	NS	*

Means within the same column within different superscript are significantly different.
NS= No Significant * = Significantly at 0.05 ** = Significantly at 0.01

Table (9): Effect of Lactobacillus Acidophilus and Biogen supplementation levels on economic efficiency and relative economic efficiency at the end of the experiment.

Feed Additives	Levels g/kg	Average* of total egg production Pear hen	Price Of One Egg (LE.)	Total Price of Eggs LE.	Daily feed intake Pear hen (g)	Total feed Intake Pear hen (g)	Feed price of ton (LE)	Total Feed cost Pear hen (LE.)	Net Revenue (LE.)	Economic Efficiency (EE)	Relative Economic Efficiency (REE)
Control	0.00	41	0.45	20.78	115.6	9710	1800	17.48	3.30	18.88	100.00
Lacto.	0.25	42	0.45	20.92	122.6	10298	1809	18.63	2.29	12.29	65.11
	0.50	45	0.45	22.37	112.9	9484	1818	17.24	5.13	29.76	157.61
	0.75	47	0.45	23.42	118.2	9929	1827	18.14	5.28	29.11	154.17
Biogen	0.50	44	0.45	21.94	113.7	9551	1815	17.34	4.56	26.30	139.29
	1.00	44	0.45	21.84	114.1	9585	1830	17.54	4.30	24.52	129.85
	1.50	41	0.45	20.63	101.3	8509	1845	15.70	4.93	31.40	166.32
	2.00	38	0.45	18.98	111.7	9383	1860	17.45	1.53	8.77	46.44

* Total numbers of egg after calling unsuitable for hatching= total egg production X 90%.

Net revenue = Total price of eggs – total feed cost

Economical efficiency (E.E). = $\frac{\text{Net revenue}}{\text{Total feed cost}}$ X100

Relative economical efficiency (REE), assuming control treatment = 100 %.

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تأثيرمستويات مختلفة من اللاكتوباسلس و البيوجين على الصفات الانتاجية للسلالات المستنبطة محليا

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تهدف الدراسة الى تقيم تأثير اضافة مستويات متدرجة من اللاكتوباسلس والبيوجين كاضافات غذائية على أداء الدجاجات البياضة. أستخدم في هذه الدراسة ٢٤٠ دجاجة و ٢٤ ديك جميزة عمر ٢٠ أسبوع و قسمت عشوائيا الى ثمانية معاملات بكل منها ٣٠ دجاجة و ٣ ذكور ، فى ثلاث مكررات. مستويات الاضافة لكل من اللاكتوباسلس والبيوجين كانت ٠,٢٥ ، ٠,٥ ، ٠,٧٥ جم من اللاكتوباسلس /كجم علف وكانت ٠,٥ ، ١,٠ ، ١,٥ ، ٢,٠ جم بيوجين /كجم علف على التوالى.تم تربية الطيور في اعشاش ارضية في عنابر مفتوحة تحت نفس الظروف من الرعاية الى عمر ٣٦ أسبوع.

أوضحت النتائج ان زيادة مستويات الاضافة من اللاكتوباسلس والبيوجين ادى الى زيادة معنوية في أنتاج البيض وان أفضل أنتاج بيض سجل للدجاجات التى غذيت على علف يحتوى على ٠,٧٥ جم من اللاكتوباسلس /كجم خلال فترات الدراسة.

أدت المستويات المتدرجة من اللاكتوباسلس والبيوجين الى زيادة معنوية في كلا من وزن البيض وكتلة البيض وبصفة عامة فان أكبر وزن بيض سجل للدجاجات التى غذيت على علف يحتوى على ٠,٥ جم من اللاكتوباسلس وبينما كان أفضل كتلة بيض للدجاجات التى غذيت على ٠,٧٥ جم من اللاكتوباسلس. أفضل وزن بيض(٤٦.٥جم) وكتلة بيض(٢٦.٧٦جم/دجاجة/يوم) سجل للدجاجات التى غذيت على ٠.١جم بيوجين.

زيادة مستوى اللاكتوباسلس والبيوجين تؤدى الى تحسن معنوى في الكفاءة التحويلية للعلف. وكانت أفضل كفاءة تحويلية(٣.٩٢) للدجاجات التى غذيت على مستوى٧٥.٠جم ا للاكتوباسلس و كانت أفضل كفاءة تحويلية للعلف(٤.٠٩) للدجاجات التى غذيت على مستوى٥.١جم بيوجين.

تركيز الألبيومين بالبلازما لم يتأثر معنويا باى مستوى من اللاكتوباسلس أوالبيوجين في أعلاف الدجاجات، بينما يزداد تركيز البروتين الكلى والجلوبيولين بالبلازما مع زيادة مستوى كلا من اللاكتوباسلس أوالبيوجين. أنخفض تركيز الدهون الكلية و الكوليسترول بالبلازما مع زيادة مستوى الاضافة من اللاكتوباسلس والبيوجين فى اعلاف الدجاجات

لاتوجد اى اختلافات معنوية بين المعاملات وذلك لكل من مكونات البيضة و مقايس صفات الجودة الداخلية والخارجية للبيض فيما عدا صفة وحدات هيو.

حققت الدجاجات التى غذيت على علف مضاف الية اللاكتوباسلس بمستوى ٠,٥ جم /كجم علف أو البيوجين بمستوى ١,٥ جم /كجم علف تحقق اكبر عائد اقتصادى نسبى (١١٦.٧٠ و١١٧.٣١ على التوالى) مقارنة بالمستويات الأخرى.

يستخلص من الدراسة أن مستوى الأضافة ٠,٥ جم لاكتوباسلس /كجم علف و مستوى ١,٥ جم بيوجين /كجم علف يعطى أفضل عائد أقتصادى وكذلك يؤدى الى تحسن فى أداء ومناعة الدجاجات.