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EFFECT OF FLAVOMYCIN AND SOME PROBIOTIC PROMOTERS ON PRODUCTIVE AND REPRODUCTIVE TRAITS OF MANDARAH AND SALAM HENS

Shehata, M.M.[1]; A.A. Askar[2]; Salwa G.K. Genedy[3] and I.I. Hassan[1]

[1] **Agriculture research Center, Animal Production Research Institute, Dokki, Giza, Egypt.**

[2] **Poultry Department, Fac. of Agric., Zagazig Univ., Zagazig, Egypt.**

[3] **Department of Poultry Production, Fac. of Agric., Tanta Univ., Kafr El-Shikh, Egypt.**

ABESTRACT

A total number of 156 hens of tow local strains, Mandarah and Salam of 25 weeks of age were used in this study to investigate the effect of strain and some promoters on the performance of laying hens. Birds of each strain were randomly divided into 4 groups of 39 hens each. The first group fed a basal diet containing 15.88% CP and 2750 Kcal/kg diet. The other groups (2; 3 and 4) fed the basal diet supplemented with 120 mg Flavomycin/kg diet; 1.0 g Dinaferm®/Kg diet and 1.0 g Bio-nutra®/kg diet, respectively.

Salam hens were recorded significantly (P< 0.05) higher egg production and egg number than those of Mandarah ones from 29-36 and 25-40 wks for egg production and from 29-36 wks for egg number. Flavomycin treatment had the highest (P<0.05 or 0.01) values of egg production and egg number followed by Bio-nutra® and Dinaferm® groups during all the experimental periods. Egg weight and egg mass were significantly (P<0.05) increased in Salam hens vs. those of Mandarah ones, except egg weight through 33-36 wks. Similar egg weights were observed in the different experimental treatments. While egg mass in birds treated with Flavomycin or Bio-nutra® was significantly (P<0.05 or 0.01) higher than that of Dinaferm® during 33-40 wks.

Yolk and shell weights and shell thickness did not show any significant difference due to strain or treatment effects, except for shell thickness in Mandarah birds that had higher (P<0.05) shell thickness than that of Salam ones. Salam birds treated with Bio-nutra® had higher values of shell thickness vs. the control group. Fertility and hatchability percentages were significantly (P<0.05) higher in Mandarah strain than those of Salam one, while, chicks' weight at hatching was significantly (P<0.05) lower in Mandarah hens. Hens treated with Bio-nutra® had the higest percentages of fertility and hatchability (P<0.01). Meanwhile, birds fed Flavomycin and Dinaferm® were of lower percentages. Chicks weight did not differed significantly due to the dietary treatment.

The two strains had similar values of feed consumption during 33-40 wks, while, feed consumption and feed efficiency were significantly (P<0.05) better for Salam strain than Mandarah one during the other periods of the experiment. Feed consumption of treated groups was significantly (P<0.05) increased than that of the control. Birds treated with Flavomycin or Bio-nutra® had the best values of feed efficiency.

The interaction effects (strain with treatments) were insignificant for previous traits, except for egg weight during 29-32 wks and shell thickness, which were significant (P<0.05).

Salam hens had slightly higher values of digestibility coefficients for the all nutrients than those of Mandarah hens. The supplementation of performance promoters and the interactions (strain with treatments) affected significantly (P<0.05) the digestion coefficients of DM; CP; CF and NFE, while OM and EE did not significantly differed. Flavomycin and Bio-nutra® showed the highest values of digestion coefficients, meanwhile Dinaferm® had the lowest ones in comparison with those of the control group.

Salam strain exhibited higher economic efficiency than that of Mandarah one (+7.8%). Groups of Flavomycin had the highest economic efficiency followed by that of those fed diet with Bio-nutra® (+106.1 and +66.1%, respectively).

Keywords: Strain, probiotics, production, reproduction, digestibility, layers.

INTRODUCTION

Using the antimicrobial substances (antibiotics) as performance promoters led to nemours problems such as pathogens resistance and environmental pollution, beside, the riskiness of residual part of these material in the meat (Miles, 1993 and El-Kordy, 2002) Accordingly, many countries took other direction by using the probiotics such as, yeast culture as an alternative to the antibiotics. Probiotics are nun-nutritional additives contain beneficial microbial organisms and large amount of its metabolites that enhance the performance of the host animals. They are not a part in the metabolic processes, but can inhibit the harmful bacteria; counteracting some growth depressant; modifying the hormonal balance or improving feed quality and palatability (Miles and Bootwella, 1991 and Hassan et al, 2003). There are accumulated evidences indicated that impact of microorganisms in poultry diets improved productive and reproductive performance (Chapman, 1989). Also, Hattaba *et al.*, (1994) and Najib (1996) mentioned that breed and microorganisms interacted with egg production; egg mass and feed conversion. Studies concerning the effect of such promoters on laying hens performance are scanty.

The aim of the present work was to examine the effect of two probiotic promoters (Dinaferm® and Bio-nutra®) as unconventional promoters on the performance of Mandarah and Salam hens as comparing with one of the classical performance promoters (Flavonycin antibiotics).

MATERIAL AND METHODS

The experimental work was carried out at Sakha Research Station Kafr El-Shikh, Animal Production Research institute, Agriculture Research center. The experimental period lasted for 16 weeks starting from April 2002.

Tow local strains, Mandarah and Salam; of 25 weeks of age were used in this study. A total number of 156 hens of each strain were reared on a conventional production program up to 24 weeks of age. Hens of each strain were randomly divided into 4 groups of 39 hens each with 3 replicates of 13 hens. The first group fed a basal diet containing 15.88% CP and 2750 Kcal/kg diet. The other groups (2; 3 and 4) fed the basal diet supplemented with 120 mg Flavomycin/kg diet; 1.0 g Dinaferm®/Kg diet and 1.0 g Bio-nutra®/kg diet, respectively. The composition and calculated chemical analysis of the basal diet are presented in Table 1.

Table 1. Composition and Calculated chemical analysis of the basal diet.

Ingredient	%
Yellow corn	66.70
Soybean meal (44%)	19.30
Wheat bran	2.74
Fish meal	1.50
Dicalcium phosphate	1.50
Limestone	7.60
Salt	0.30
Vit.+Min. Premix*	0.30
DL-methionine	0.06
Total	100.00
Calculated analysis**	
Crude protein	15.69
ME Kcal/kg	2750.00
CF	2.98
Ca	3.28
P	0.64
Lysine	0.83

*Each 1kg of the diet with, Vit. A 10000 IU; Vit. D_3 1000 IU; Vit. E 10 mg; Vit. K 1 mg; Vit. B2 4.0 mg, Vit. B6 1.5 mg; Pantothenic acid 10 mg ; Vit. B12 0.01 mg; Folic acid 1 mg; Naicim 20 mg; Biotin 0.05 mg; Choline chloride 500 mg; Zn. 45 mg; Cu. 3 mg; Fe. 30 mg;.. I. 0.3 mg; Se. 0.1 mg; Mn. 40 mg and Ethoxyquine 3000 mg.
**Calculated according to NRC (1994).

Dinaferm® is a probiotic produced by Dinatic American Company, USA. Each one-gram of it contains 1000,000,000 colony of yeast (*Sacharomyces cervisae*). It contains protein 35%, fat 5% and crude fiber 10%. Bio-nutra® is a probiotic produced by Ameco Bios Company. Each kg of this product includes: *Saccharomyces cervisae* 220 Billion CFU, *Asperigllus oryzae* 15 g, *Lactobacillus acidophilus* 1100 Million CFU, *Streptococcus faecium* 770 Million CFU, *Lactobacillus plantcurum* 330 Million CFU, *Bacillus subtilis* 1 Billion CFU as Written in its pamphlet. This product contains crude protein 23%, crude fat 3% and crude fiber 6%. The contents of Dinfarm® and Bio-nutra® from amino acids; vitamins and minerals as written in its pamphlets are presented in table 2. Birds were subjected under the same managerial; hygienic and environmental conditions with free access to feed and water *ad-libitum.* Artificial light was used beside the normal daylight to provide 16 hours day photoperiod.

All performance measurements were based on 4-weeks interval throughout the experimental period, which lasted for 16 consecutive weeks from 25 to 40 weeks of age. Egg production traits including egg production percent %; egg weight (g); egg number and egg mass (g/d.) were recorded and calculated daily. Feed intake (g/hen/d.) and feed conversion (feed/egg) were calculated for each 4 weeks. Egg quality measurements including egg; yolk and shell weights (g) and shell thickness (mm) were recorded during the last period of study (37-40 weeks). Eggs produced from the beginning of the 37th weeks up to the end of the experiment were incubated to determine the fertility and hatchability percentages and chick weight at hatch. At the end of the experiment, 4 males of each group were kept in metabolic cages individually to determine the digestibility coefficient of nutrients in digestibility trials. The proximate analysis of diets and excreta was done according to AOAC (1990).

The statistical analysis was done according to SAS program (1994) using the following model:

$$Y_{ijk} = \mu + S_i + T_j + ST_{ij} + e_{ijk}$$

Where,

Y_{ijk} = The whole observation on k^{th} bird.

μ = The common mean

S_i = The fixed effect of i^{th} strain (i = 1 and 2).

T_j = The fixed effect of j^{th} treatment (j = 1; 2; 3 and 4).

ST_{ij} = The interaction effect of strain with treatment.

e_{ijk} = The random error assumed to be independently randomly distributed.

Comparison between treatment means followed by Duncan's multiple range test (Duncan, 1955).

Table 2. The Composition of Dinaferm® and Bio-nutra® of minerals; Vitamins and amino acids in each kg.

Items	Dinaferm®	Bio-nutra®
Amino acids (%)		
Valin	2.05	1.24
Phenylalanine	2.03	2.20
Trytophan	0.38	0.36
Arginine	1.88	0.87
Histidine	0.85	0.39
Isoleucine	1.45	0.74
Leucine	3.46	1.53
Lysine	1.63	0.77
Methionine	0.62	0.35
Thereonine	1.37	0.87
Cystine	0.58	
Vitamins/kg :		
Pantothenic acid	59.20mg	20.50mg
Biotin	2.44mg	0.73mg
Choline	3401.00mg	1720.00mg
Vit. E	36.81 IU	29.00 IU
Folic acid	7.80mg	3.45mg
Niacin	245.50mg	79.80mg
Thiamine	46.20mg	9.74mg
Riboflavin	18.25mg	4.71mg
Pyridoxin	22.00mg	
Minerals		
P	1.07%	0.87%
Se	1.1ppm	0.36ppm
Na	0.15%	
Cobalt	0.16mg/kg	
Iron	184.05mg/kg	
Mg	0.22%	
Ca	0.22%	0.19%
Mn	21.3mg/kg	
Iodine	0.24mg/kg	
Cu	29.6mg/kg	
Zn	36.05mg/kg	

RESULTS AND DISCUSSION

Egg production:

Results presented in Table 3 show that Salam hens were recorded higher egg production and egg number than those of Mandarah ones. This surpassing was significant (P< 0.05) from 29-36 wks and 25-40 wks for egg production and from 29-36 wks for egg number. Similar results were reported also in Mandarah hens by Abd El-Ghany *et al.*, (2002). They found that egg production was decreased in the non-selected line than that of the selected one for egg production.

In comparison with the treatment groups, Flavomycin treatment had the highest (P<0.05 or 0.01) values of egg production and egg number during all the experimental periods followed by Bio-nutra® and Dinferm® groups, while, the lowest values were obtained in the control group (Table 3). The present findings were in agreement with those obtained by Francis *et al.*, (1978), who found that laying hens performance was improved with the dietary inclusion either of *lactobacillus acidophilus* or zinc bacitracin. Also, Panda *et al.*, (2003) reported that the addition of probiotic significantly increased the egg production in White Leghorn layers. In contrary, Soliman (2003) clarified that active dried yeast and bacitracin caused a decreasing in egg production of Bovans White laying hens.

The interaction effects (strain with treatments) on egg production and egg number were insignificant during the different intervals of the experiment.

Egg weight and egg mass were significantly (P<0.05) increased in Salam hens vs. those of Mandarah ones, except egg weight through 33-36 wks, which was similar in the two strains (Table 4). Significant effects were found also in these traits in two lines of Mandarah hens (Abd El-Ghany *et al.*, 2002). They added that line 2 (selected for egg production) showed higher egg mass than the first line (non-selected).

Similar egg weights were observed in the different experimental treatments (Table 4). Egg mass in birds treated with Flavomycin or Bio-nutra® probiotic was significantly (P<0.05 or 0.01) higher than that of Dinaferm® group during 33-40 wks. All the treatment groups were surpassed the control group in egg mass trait (p<0.05 or 0.01). Other findings on egg weight were in closely agreement with the present ones (Soliman, 2003). He maintained that egg weight was not affected by active dried yeast or bacitracin, while egg mass was slightly decreased as a result to the two factors. Egg mass was also increased du to the addition of the antimicrobial, Zinc bacitracin (Bronsch and Manner, 1991).

There is no significant differences in egg weight and egg mass du to the interaction effects through the experimental periods, except during 29-32 wks for egg weight, which was significant (P<0.05). Salam hens treated with Denaferm® showed the highest values of egg weight comparing with the other groups. This may be attributed to the positive effect of Dinaferm® and Salam strain on egg weight trait.

Table 3. Effect of Strain and some promoters and their interactions on egg production % and egg number (X±SE) of laying hens.

Items		Egg production %					Egg Number				
		25-28 wks	29-32 wks	33-36 wks	37-40 wks	25-40 wks	25-28 wks	29-32 wks	33-36 wks	37-40 wks	25-40 wks
Strain		NS	*	*	NS	*	NS	*	*	NS	NS
Mandarah		65.06±0.71	66.08±0.67	67.68±0.67	60.85±0.59	64.84±0.62	18.22±0.19	18.47±0.19	18.84±0.16	17.01±0.16	18.11±0.22
Salam		65.96±0.67	68.62±0.74	69.21±0.69	60.71±1.04	66.43±0.65	18.47±0.18	19.21±0.20	19.35±0.19	17.20±0.18	18.59±0.18
Treatments		**	**	**	**	**	**	**	*	*	**
Control		58.48^{c}±0.71	60.36^{c}±0.73	63.22^{d}±0.71	56.57^{c}±0.75	59.60^{d}±0.70	16.37^{c}±0.19	16.87^{c}±0.20	17.68^{d}±0.19	15.78^{d}±0.20	16.66^{c} ±0.19
Flavomycin		71.03^{a}±0.67	72.89^{a}±0.74	73.49^{a}±0.73	63.86^{a}±1.78	70.75^{a}±0.65	19.89^{a}±0.18	20.41^{a}±0.20	20.55^{a}±0.20	18.33^{a}±0.20	19.80^{a}±0.18
Dinaferm		65.76^{b}±0.67	67.16^{b}±0.70	66.34^{c}±0.69	59.70^{b}±0.66	64.85^{c}±0.63	18.41^{b}±0.18	18.80^{b}±0.19	18.51^{c}±0.18	16.71^{c}±0.18	18.16^{b}±0.17
Bio-Nutra		66.55^{b}±0.65	68.79^{b}±0.71	70.47^{b}±0.82	62.61^{ab}±0.68	67.03^{b}±0.62	18.63^{b}±0.18	19.26^{b}±0.20	19.58^{b}±0.18	17.53^{b}±0.19	18.73^{ab}±0.17
Interactions		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Mandara	Control	57.51±0.99	59.37±0.99	62.68±1.03	56.64±1.03	58.92±0.99	16.10±0.27	16.57±0.26	17.51±0.27	15.82±0.27	16.47±0.26
	Flavo.	70.80±0.94	71.15±0.94	71.69±0.94	64.71±1.01	69.59±0.90	19.82±0.26	19.92±0.26	20.02±0.25	18.12±0.28	19.47±0.25
	Dinaferm	65.58±0.95	65.97±0.97	65.78±0.98	59.61±0.97	64.18±0.86	18.36±0.29	18.47±0.27	18.42±0.27	16.69±0.27	17.97±0.24
	Bio-nutra	65.98±0.93	67.57±0.94	69.99±1.34	61.95±0.95	66.37±0.89	18.47±0.26	18.92±0.26	19.32±0.25	17.34±0.26	18.51±0.24
Salam	Control	59.45±0.99	61.41±1.06	63.74±0.99	56.50±1.12	60.27±1.01	16.64±0.27	17.19±0.29	17.84±0.27	15.75±0.30	16.86±0.28
	Flavo.	71.28±0.98	74.72±1.03	75.39±0.98	62.97±3.55	71.90±0.88	19.96±0.27	20.92±0.28	21.11±0.27	18.56±0.29	20.13±0.24
	Dinaferm	65.94±0.96	68.29±0.97	66.87±0.96	59.80±0.92	65.52±0.92	18.46±0.26	19.12±0.27	18.60±0.26	16.73±0.25	18.34±0.26
	Bio-nutra	67.12±0.93	70.07±1.03	70.97±0.95	63.31±0.98	67.70±0.88	18.79±0.26	19.62±0.28	19.87±0.26	17.73±0.27	18.95±0.24

Means in the same column within each factors differently superscripted are significantly differed ($P<0.05$ or0.01).
ns = not significant.

Table 4. Effect of strain and some promoters and their interactions on egg weight and egg mass (X±SE) of laying hens.

Items		Egg Weight (g)					Egg Mass (g/d.)				
		25-28 wks	29-32 wks	33-36 wks	37-40 wks	25-40 wks	25-28 wks	29-32 wks	33-36 wks	37-40 wks	25-40 wks
Strain		*	*	NS	*	*	*	*	*	*	*
Mandarah		49.62±0.15	51.77±0.16	53.43±0.15	53.55±0.17	52.06±0.15	32.56±0.33	34.17±0.31	36.15±0.35	32.55±0.29	33.37±0.30
Salam		51.72±0.16	52.69±0.16	53.47±0.65	54.46±0.18	53.02±0.21	34.11±0.34	36.19±0.38	37.44±0.36	33.52±0.32	35.19±0.34
Treatments		NS	NS	NS	NS	NS	**	**	*	*	*
Control		50.22±0.25	52.26±0.23	53.66±0.25	53.94±0.27	52.48±0.23	29.35^{c}±0.33	31.51^{c}±0.34	33.90^{d}±0.34	30.47^{d}±0.34	31.25^{d}±0.33
Flavomycin		50.87±0.28	52.28±0.24	52.73±1.26	51.21±0.26	52.49±0.37	36.06^{a}±0.31	38.10^{a}±0.37	39.63^{a}±0.36	35.46^{a}±0.32	37.12^{a}±0.38
Dinaferm		50.92±0.31	52.44±0.27	53.76±0.23	53.98±0.27	52.69±0.26	33.46^{b}±0.34	35.20^{b}±0.37	35.65^{c}±0.34	32.19^{c}±0.30	34.15^{c}±0.31
Bio-Nutra		50.62±0.26	51.96±0.22	53.67±0.22	53.85±0.24	52.49±0.22	33.67^{b}±0.32	35.73^{b}±0.35	37.80^{b}±0.35	33.68^{b}±0.31	35.16^{b}±0.30
Interactions		NS	*	NS	NS	NS	NS	NS	NS	NS	NS
Manda.ra	Control	49.53±0.31	52.45^{abc}±0.33	53.24±0.34	53.39±0.35	52.13±0.31	28.46±0.43	31.07±0.44	33.34±0.47	30.21±0.47	30.69±0.50
	Flavo.	49.82±0.31	51.69^{c}±0.33	53.64±0.32	53.78±0.35	52.23±0.25	35.25±0.40	36.75±0.41	38.43±0.43	34.76±0.44	36.32±0.38
	Dinaferm	49.49±0.30	51.48^{c}±0.32	53.37±0.31	53.48±0.36	51.84±0.32	32.43±0.41	33.94±0.44	35.09±0.45	31.84±0.44	33.25±0.39
	Bio-nutra	49.62±0.32	51.49^{c}±0.29	53.45±0.31	53.51±0.35	52.02±0.30	32.71±0.39	34.74±0.42	37.39±0.70	33.11±0.41	34.50±0.40
Salam	Control	50.91±0.32	52.07^{bc}±0.31	54.05±0.35	54.49±0.37	52.84±0.34	30.24±0.43	31.94±0.49	34.43±0.47	30.74±0.47	31.81±0.46
	Flavo.	51.97±0.32	52.85^{ab}±0.31	51.77±2.58	54.67±0.35	52.75±0.64	36.88±0.41	39.64±0.45	40.84±0.45	36.16±0.43	37.92±0.61
	Dinaferm	52.35±0.31	53.35^{a}±0.32	54.14±0.34	54.50±0.39	53.53±0.33	34.49±0.44	36.41±0.45	36.18±0.48	32.56±0.42	35.05±0.42
	Bio-nutra	51.62±0.29	52.46^{abc}±0.31	53.89±0.33	54.20±0.33	52.95±0.31	34.63±0.43	36.73±0.47	38.22±0.47	34.28±0.44	33.73±0.30

Means in the same column within each factors differently superscripted are significantly differed (P<0.05 or0.01).
ns = not significant.

Egg quality:

Results illustrated in Table 5 show that egg quality traits (yolk and shell weights and shell thickness) did not show any significant difference du to strain; treatment or interaction effects, except for shell thickness due to strain and interaction effects, which was significant ($P<0.05$). Birds of Mandarah strain had higher value of shell thickness than that of the other strain. The treated groups, especially for Salam strain had lower values of shell thickness than that of the control group of Mandarah strain, which had the highest value of this trait. Similar observation for the effect of strain on egg quality traits were obtained also by Abd El-Ghany *et al.* (2002), they found that yolk and shell weights and shell thickness were in similar values in selected or non-selected lines for egg production traits in Mandarah hens. On the other hand shell weight was slightly increased or decreased due to the effect of active dried yeast or bacitracin, respectively, while the shell thickness was decreased due to the effect of the two promoters (Soliman, 2003). Also, Panda *et al.*, (2003) reported that the addition of probiotic significantly increased shell weight and shell thickness in White Leghorn layers.

Table 5. Effect of strain and some promoters and their interactions on egg; yolk and shell weights (g) and shell thickness (mm) of laying hens.

Items		Egg weight	Yolk weight	Shell weight	Shell thickness
Strain		*	NS	NS	*
Mandarah		$51.42^{b}\pm0.21$	17.91 ± 0.24	4.97 ± 0.11	$39.37^{a}\pm0.64$
Salam		$53.58^{a}\pm0.29$	17.18 ± 0.36	4.97 ± 0.09	$36.81^{b}\pm0.72$
Treatments		NS	NS	NS	NS
Control		52.55 ± 0.51	17.54 ± 0.44	5.02 ± 0.17	38.25 ± 1.30
Flavomycin		52.46 ± 0.55	18.45 ± 0.35	4.97 ± 0.18	37.50 ± 1.40
Dinaferm		52.83 ± 0.47	17.08 ± 0.40	4.77 ± 0.08	38.00 ± 0.70
Bio-Nutra		52.15 ± 0.53	17.13 ± 0.48	5.12 ± 0.11	38.62 ± 0.88
Interactions		NS	NS	NS	*
Mandara	Control	51.48 ± 0.38	17.61 ± 0.63	5.22 ± 0.23	$40.50^{a}\pm1.55$
	Flavo.	50.99 ± 0.52	18.59 ± 0.50	4.80 ± 0.32	$40.25^{a}\pm1.71$
	Dinaferm	51.93 ± 0.42	17.83 ± 0.48	4.72 ± 0.03	$39.50^{ab}\pm0.64$
	Bio-nutra	51.30 ± 0.43	17.63 ± 0.26	5.14 ± 0.22	$37.25^{cd}\pm0.85$
Salam	Control	53.62 ± 0.56	17.47 ± 0.72	4.83 ± 0.23	$36.00^{d}\pm1.47$
	Flavo.	53.94 ± 0.51	18.31 ± 0.57	5.15 ± 0.19	$37.75^{cd}\pm1.10$
	Dinaferm	53.73 ± 0.56	16.33 ± 0.40	4.82 ± 0.17	$36.50^{d}\pm0.64$
	Bio-nutra	53.01 ± 0.81	16.63 ± 0.93	5.09 ± 0.11	$40.00^{ab}\pm0.64$

Means in the same column within each factors differently superscripted are significantly differed ($P<0.05$), ns = not significant.

Fertility and hatchability:

Fertility and hatchability percentages were significantly ($P<0.05$) higher in Mandarah strain than those of Salam one (Table 6). While, chicks' weight at hatching showed opposite trend, since, it was significantly ($P<0.05$) lower in Mandarah hens. The present data indicated that group of hens treated with Bio-nutra® had the highest percentages of fertility and hatchability ($P<0.01$). Meanwhile, the other two groups (Flavomycin and Dinaferm®) were of lower percentages of these traits as compared with either the control or Bio-nutra® groups. Chicks' weight did not differed significantly due to the treatment effect. The improvement in these traits due to probiotics may be attributed to the considerable improvement in the biological value; nutrient digestibility and metabolism of protein; minerals and vitamins (Sarra and Badini, 1998). Whereas, fertility % was decreased in hens fed 5.0 µg/kg diet of cholecalciferol compared with those fed 24 µg/kg diet of cholecalciferol (Ameenuddin *et al.*, 1986) or due to riboflavin deficiency in breeding hen (Rennie *et al.*, 1990). Also, hatchability % was adversely affected by selenium; vitamin E or riboflavin deficiency in laying hens (Latshaw *et al.*, 1977; Hennig *et al.*, 1986 and Rennie *et al.*, 1990, respectively). Hens fed low level of vitamin D3 did not have adequate amounts of the vitamin to transport to the egg for normal embryonic development, since, hatchability of eggs from hens fed 300 IU vitamin D3/kg feed was reduced by 48% from that of hens fed the higher levels (Stevens *et al.*, 1984).

The interaction effects (strain with treatments) on fertility; hatchability percentages and chick weight were insignificant.

Table 6. Effect of strain and some promoters and their interaction on fertility; hachability and chicks weight of laying hens.

Items		Fertility (%)	Hatchaility %		Chicks weights (g)
			Fertile eggs	Total eggs	
Strain		*	*	*	*
Mandarah		$86.27^{a}\pm0.90$	$74.77^{a}\pm1.91$	$68.44^{a}\pm1.91$	$33.98^{a}\pm0.60$
Salam		$84.13^{b}\pm0.32$	$72.14^{b}\pm2.13$	$66.46^{b}\pm1.81$	$36.45^{b}\pm0.60$
Treatments		**	**	**	NS
Control		$85.66^{b}\pm0.82$	$74.24^{b}\pm1.08$	$68.12^{b}\pm0.69$	35.21±1.03
Flavomycin		$83.72^{b}\pm0.60$	$69.64^{c}\pm1.20$	$64.38^{c}\pm0.49$	35.20±1.01
Dinaferm		$81.04^{c}\pm1.18$	$66.56^{c}\pm1.12$	$60.55^{d}\pm0.53$	34.76±1.10
Bio-Nutra		$90.40^{a}\pm0.67$	$83.37^{a}\pm1.18$	$76.76^{a}\pm1.24$	35.70±1.04
Interactions		NS	NS	NS	NS
Mandara	Control	86.90±0.76	76.01±1.61	69.48±0.48	34.12±1.44
	Flavo.	84.81±0.63	71.35±0.72	65.01±0.74	33.85±1.20
	Dinaferm	83.02±0.08	68.06±1.89	61.42±0.50	33.55±1.51
	Bio-nutra	90.36±1.48	83.63±2.24	77.86±1.95	34.41±1.44
Salam	Control	84.42±1.13	72.46±0.27	66.76±0.55	36.31±1.43
	Flavo.	86.62±0.47	67.94±1.95	63.75±0.50	36.55±1.36
	Dinaferm	79.06±1.75	65.06±0.73	59.69±0.66	35.97±1.54
	Bio-nutra	90.44±0.30	83.10±1.39	75.66±1.65	36.98±1.30

Means in the same column within each factors differently superscripted are significantly differed (P<0.05 or0.01), ns = not significant.

Feed utilization:

Irrespective of, the similar values of feed consumption during 33-40 wks in the two strains, feed consumption and feed efficiency were significantly (P<0.05) better for Salam strain during the other periods of the experiment as comparing with those of Mandarah (Table 7). The differences in feed consumption and conversion between two lines of Mandarah hens were significant also (Abd El-Ghany *et al.*, 2002). Also, feed conversion of Dandarawi chicks was better than that of Golden Montazah chicks (Abd El-Wahed *et al.*, 2003).

Feed consumption of antibiotic and probidics groups were in similar values and significantly (P<0.05) increased than that of the control one during all intervals of the experiment, except those from 33-36 wks, which were insignificant (Table 7). During all the experimental periods, feed efficiency was significantly (P<0.05) improved in the treated groups vs. the control one. Moreover, birds treated with Flavomycin or Bio-nutra® had the best values of feed efficiency as compared with the other groups. Conflicted results regarding the effect of growth promoters on feed intake, were found in the literature, meanwhile (El-Kordy, 2002) reported similar observations for the effect of Flavomycin; Dinaferm® and Bio-nutra® on feed consumption in Hubbard broilers. Other investigators clarified that the microbial probiotic (Lacto Sacc and Yea Sacc) in growing quails (Abdel-Azeem *et al.*, 2001) and yeast and bacitracin in Bovans White laying hens and broiler chicks (Soliman, 2003 and Soliman *et al.*, 2003, respectively) decreased the feed consumption. The present results regarding to feed conversion were in the same trend of the findings obtained by the pervious mentioned authors.

The interaction effects (due to strain x treatments) on feed consumption and feed conversion were insignificant during the different intervals of the experiment.

Nutrients digestibility:

Results presented in Table 8 show that Salam hens had slightly higher values of digestion coefficients for the all nutrients than those of Mandarah hens. The supplementation of such promoters and the interactions (strain with treatments) affected significantly (P<0.05) the digestion coefficients of DM; CP; CF and NFE, while OM and EE did not significantly differed. Flavomycin and Bio-nutra® showed the highest values of digestion coefficients, meanwhile Dinaferm® had the lowest ones in comparison with those of the control group. The improvement of nutrients digestibility due to supplementation of probiotics was confirmed also by El-Hindawy *et al.*, (1993) in growing rabbits; Abdel-Azeem (2002) in broilers and Soliman (2003)in laying hens. They indicated that the addition of yeast culture improved the digestibility coefficients of the most nutrients. On contrary, Soliman *et al* (2003) clarified that broiler chicks fed diet with dried yeast had lower values of digestion coefficient for all nutrients as compared by the control. The improvement in nutrients digestibility due to Flavomycin was supported by other results in growing rabbits (Baraghit and Ahmed, 1989). He noticed that adding Flavomycin improved significantly the digestibility of all nutrients, with the exception of EE. Closely opposite results were obtained in growing rabbit by Soliman *et al.*, (2000), who mentioned that Flavomycin caused a decrease in the digestibility coefficient of all nutrients.

Economic efficiency:

Results presented in Table 9 show that Salam strain exhibited higher economic efficiency than that of Mandarah strain (+7.8%). Birds fed diet supplemented with Flavomycin had the highest economic efficiency followed by that of those fed diet with Bio-nutra® (+106.1 and +66.1%, respectively). So, Salam hens had absolutely higher economic efficiency when fed diet supplemented with Flavomycin (+116.6%) or Bio-nutra® (+90.0%). Increasing the economic efficiency in these groups might be due to the good performance of Salam strain, particularly that treated with Flavomycin or Bio-nutra®. Similar observations were obtained also by Abdel-Azeem *et al.*, (2001) in growing Japanese quail treated with Yea Sacc or Lacto Sacc (microbial probiotics). In Bovans white laying hens, addition of yeast did not improve the economic efficiency, while bacitracin scored higher economic efficiency than the control group (Soliman, 2003).

The improvement in the studied traits due to probiotics may be attributed to the considerable improvement in the biological value; nutrient digestibility and metabolism of protein; minerals and vitamins (Schulz and Oslage, 1976 and Sarra and Badini, 1998) and to the large amount of metabolites, which can enhance hen performance (Miles and Bootwella 1991 and Hassan *et al.*, 2003). Also, Miles (1993) and Elmer (2001) concluded that probiotics could be regulated the microbial environment of the intestine; decrease digestive disturbances; inhibit pathogenic intestinal microorganisms and improve feed conversion efficiency as the intestinal mucous membrane become healthy.

The positive effect of Flavomycin my be due to the action of the antibiotics that suggested by Hay (1978) and Willims and Fuller (1971), such as improving nutrient absorption, modifying the microflora population of the digestive tract; suppression of the pathogenic bacteria and eliminating the undesirable microorganisms that produce toxins, which, irritate and increase the thickness of the intestine resulting in decreasing the absorption of nutrients. Also, it could be spar nutrients, particularly protein, where it reduces the microbial breakdown of protein resulting in lowered ammonia content in the intestinal lumen and increased digestibility of amino acids (Bonomi *et al.*, 1974).

It could be concluded that supplementation of probiotics to laying hens diet as an alternative to the antibiotics could be used to improve their performance, especially Bio-nutra® that had the best performance after Flavomycin and then Dinaferm®.

Table 7. Effect of strain and some promoters and their interactions on feed consumption and feed efficiency (X±SE) of laying hens.

Items		Feed Consumption (g./hen/day)					Feed Efficiency (feed /egg)				
		25-28 wks	29-32 wks	33-36 wks	37-40 wks	25-40 wks	25-28 wks	29-32 wks	33-36 wks	37-40 wks	25-40 wks
Strain		*	*	NS	NS	*	*	*	*	*	*
Mandarah		119.8±2.33	127.1±1.37	128.1±2.26	129.6±1.28	125.98±2.22	3.74±0.04	3.74±0.03	3.56±0.03	4.00±0.03	3.75±0.03
Salam		122.2±1.29	129.0±1.26	128.3±2.77	130.3±2.27	127.38±2.43	3.60±0.03	3.59±0.05	3.44±0.05	3.90±0.04	3.64±0.03
Treatments		*	*	NS	*	*	*	*	*	*	*
Control		119.8^{c}±2.48	126.9^{b}±2.63	128.1±2.43	128.8^{b}±1.41	125.72^{b}±1.33	4.10^{a}±0.04	4.04^{a}±0.03	3.78^{a}±0.03	4.24^{a}±0.04	4.03^{a}±0.05
Flavomycin		121.4^{ab}±2.45	128.5^{a}±1.41	129.4±2.40	130.4^{a}±1.39	127.43^{a}±1.26	3.37^{c}±0.02	3.38^{c}±0.04	3.27^{c}±0.02	3.68^{d}±0.03	3.44^{d}±0.03
Dinaferm		122.0^{a}±2.42	128.8^{a}±2.44	126.5±1.44	130.8^{a}±2.39	126.82^{ab}±1.85	3.65^{b}±0.03	3.67^{b}±0.03	3.57^{b}±0.10	4.07^{b}±0.05	3.72^{b}±0.04
Bio-Nutra		120.6^{bc}±1.51	127.8^{ab}±1.37	128.8±2.39	129.8^{ab}±1.34	126.69^{ab}±2.25	3.59^{b}±0.03	3.58^{b}±0.05	3.42^{bc}±0.03	3.86^{c}±0.03	3.61^{c}±0.02
Interactions		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Mandara	Control	118.1±1.66	126.0±2.09	126.9±2.53	129.0±2.66	124.76±2.50	4.19±0.06	4.06±0.06	3.81±0.05	4.25±0.06	4.07±0.05
	Flavo.	120.2±2.61	127.8±1.63	128.4±1.42	130.1±1.55	126.61±1.28	3.41±0.03	3.48±0.04	3.36±0.03	3.75±0.04	3.49±0.03
	Dinaferm	120.8±2.54	127.5±2.61	128.9±2.38	130.3±1.55	126.42±1.51	3.73±0.04	3.75±0.05	3.68±0.04	4.10±0.05	3.81±0.04
	Bio-nutra	119.3±2.78	126.9±2.54	128.2±2.63	129.9±2.44	126.06±2.36	3.65±0.05	3.65±0.04	3.44±0.05	3.93±0.04	3.66±0.04
Salam	Control	120.8±1.64	127.9±1.59	129.4±1.53	129.4±1.47	126.68±1.31	4.00±0.05	4.01±0.06	3.75±0.05	4.23±0.23	3.99±0.05
	Flavo.	122.7±1.56	129.3±2.48	130.4±2.56	130.4±2.56	128.24±2.38	3.33±0.03	3.28±0.04	3.19±0.04	3.62±0.04	3.40±0.06
	Dinaferm	123.3±2.51	130.1±1.51	124.2±3.92	131.2±1.55	127.22±3.65	3.58±0.04	3.58±0.05	3.47±0.19	4.04±0.05	3.64±0.06
	Bio-nutra	122.0±2.54	128.8±2.41	129.3±2.41	129.7±2.53	127.33±1.31	3.53±0.04	3.51±0.04	3.39±0.04	3.79±0.05	3.75±0.03

Means in the same column within each factors differently superscripted are significantly differed (P<0.05).

ns = not significant.

Table 8. Digestion coefficients of nutrients as affected by the different treatments ($X\pm SE$).

Items		DM	OM	CP	CF	EE	NFE
Strain		Ns	Ns	Ns	Ns	Ns	Ns
Mandarah		78.98 ± 0.78	78.47 ± 0.81	79.08 ± 0.84	23.56 ± 0.36	79.68 ± 0.78	80.73 ± 0.69
Salam		80.76 ± 0.80	80.25 ± 0.80	80.91 ± 0.86	25.34 ± 0.38	81.49 ± 0.80	82.51 ± 0.70
Treatments		*	Ns	*	*	Ns	*
Control		$79.43^{ab}\pm0.74$	80.94 ± 0.79	$79.63^{b}\pm0.86$	$23.62^{b}\pm0.41$	81.63 ± 0.80	$80.18^{b}\pm0.65$
Flavomycin		$79.56^{ab}\pm0.75$	78.66 ± 0.80	$79.11^{b}\pm0.84$	$25.89^{a}\pm0.38$	82.81 ± 0.82	$83.66^{a}\pm0.71$
Dinaferm		$78.35^{b}\pm0.80$	76.75 ± 0.76	$78.71^{b}\pm0.85$	$22.77^{bc}\pm0.28$	79.20 ± 0.75	$79.69^{bc}\pm0.68$
Bio-Nutra		$82.15^{a}\pm0.88$	81.09 ± 0.89	$82.66^{a}\pm0.88$	$25.50^{a}\pm0.40$	78.67 ± 0.81	$82.98^{a}\pm0.77$
Interactions		*	Ns	*	*	Ns	*
Mandara	Control	$75.54^{bc}\pm0.73$	80.05 ± 0.80	$78.74^{cd}\pm0.85$	$22.73^{c}\pm0.40$	80.74 ± 0.79	$79.29^{bc}\pm0.64$
	Flavo.	$78.67^{bc}\pm0.74$	77.77 ± 0.79	$78.22^{cd}\pm0.83$	$25.00^{ab}\pm0.37$	81.92 ± 0.81	$82.77^{a}\pm0.70$
	Dinaferm	$77.46^{bcd}\pm0.79$	75.85 ± 0.77	$77.82^{d}\pm0.84$	$21.88^{c}\pm0.27$	78.31 ± 0.74	$78.80^{c}\pm0.67$
	Bio-nutra	$81.26^{ab}\pm0.87$	80.20 ± 0.88	$81.55^{bc}\pm0.87$	$24.61^{b}\pm0.39$	77.78 ± 0.80	$82.09^{b}\pm0.76$
Salam	Control	$80.32^{ab}\pm0.75$	81.83 ± 0.78	$80.52^{b}\pm0.87$	$24.51^{b}\pm0.42$	82.52 ± 0.81	$81.07^{b}\pm0.66$
	Flavo.	$80.45^{b}\pm0.76$	79.55 ± 0.81	$80.00^{b}\pm0.85$	$26.78^{a}\pm0.39$	83.70 ± 0.83	$84.55^{a}\pm0.70$
	Dinaferm	$79.24^{bc}\pm0.81$	77.64 ± 0.75	$79.60^{bc}\pm0.86$	$23.66^{b}\pm0.29$	80.20 ± 0.76	$80.85^{b}\pm0.69$
	Bio-nutra	$83.04^{a}\pm0.89$	81.98 ± 0.90	$83.55^{a}\pm0.89$	$26.40^{a}\pm0.41$	79.56 ± 0.82	$83.87^{a}\pm0.76$

Means in the same column within each factors differently superscripted are significantly differed ($P<0.05$).
ns = not significant.

Table 9. Input-output analysis and economic efficiency of the different experimental treatments.

Items		Price/kg feed (LE)	Total feed intake/hen (kg)	Total feed cost/hen (LE)	Total egg number/hen	Total egg price/hen (LE)	Net revenue/hen (LE)	Economic effeciency %	Relative to control %
Strain									
Mandarah		1.117	14.110	15.761	72.44	19.54	3.76	24.10	100.0
Salam		1.117	14.267	15.936	74.36	20.08	4.14	25.99	107.8
Treatments									
Control		1.100	14.081	15.489	66.64	17.99	2.50	16.17	100.0
Flavomycin		1.124	14.272	16.042	79.20	21.38	5.34	33.30	206.1
Dinaferm		1.120	14.204	15.908	72.64	19.61	3.71	23.29	144.1
Bio-Nutra		1.124	14.189	15.948	74.92	20.23	4.28	26.84	166.1
Interactions									
Mandara	Control	1.109	13.973	15.496	65.88	17.79	2.29	14.79	100.0
	Flavo.	1.121	14.180	15.896	77.88	21.03	5.13	32.28	218.0
	Dinaferm	1.119	14.159	15.844	71.88	19.41	3.56	22.49	152.0
	Bio-nutra	1.121	14.119	15.827	74.04	19.99	4.16	26.31	177.0
Salam	Control	1.109	14.188	15.734	67.44	18.21	2.48	15.73	106.0
	Flavo.	1.121	14.363	16.101	80.52	21.74	5.64	35.03	236.0
	Dinaferm	1.119	14.249	15.945	73.36	19.81	3.86	24.22	163.0
	Bio-nutra	1.121	14.261	15.987	75.80	20.47	4.48	28.02	190.0

The price of 1.0 kg diet = 110 PT; 1.0 kg Flavomycin = 200.0 LE; 1.0 kg Dinaferm = 20.0 LE and 1.0 kg Bio-nutra = 24.0 LE.
The price of egg = 27 PT.

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تأثير الفلافوميسين وبعض المنشطات الحيوية (بروبايوتيك) على الصفات الإنتاجية والتناسلية لدجاج المندرة والسلام

ممتاز محمد شحاتة[1] – على عبد الرازق سيد أحمد عسكر[2] – سلوى جابر قطب جنيدى[3] – إبراهيم إبراهيم حسن[1]

[1] مركز البحوث الزراعية – معهد بحوث الإنتاج الحيواني – الدقى – الجيزة – ج.م.ع

[2] قسم الدواجن – كلية الزراعة – جامعة الزقازيق – الزقازيق – ج.م.ع

[3] قسم إنتاج الدواجن – كلية الزراعة – جامعة طنطا – كفر الشيخ – ج.م.ع

استخدم عدد مقداره ١٥٦ دجاجة من سلالة المندرة والسلام عمر ٢٥ أسبوع لدراسة تأثير السلالة وبعض المنشطات على أداء الدجاج البياض. تم توزيع الدجاج في كل سلالة عشوائيا إلى ٤ مجا ميع بكل منها ٣٩ دجاجة. غذيت المجموعة الأولى على عليقه أساسية تحتوى ١٥,٨٨% بروتين خام و ٢٧٥٠ كيلو كالورى/كجم عليقه. المجموعات الأخرى (٢ ، ٣ & ٤) غذيت على العليقة الأساسية مع إضافة ١٢٠ مجم فلافوميسين / كجم عليقه و ١,٠ جرام دينافيرم / كجم عليقه و ١,٠ جرام بيو-نوترا / كجم عليقه على التوالي.

سجلت دجاجات السلام إنتاج بيضة وعدد بيض أعلى معنويا (< ٠,٠٥) عنها في المندرة من ٢٩-٢٦ ، ٢٥-٤٠ أسبوع لإنتاج البيض ومن ٢٩-٣٦ أسبوع لعدد البيض. المعاملة بالفلافوميسين أعطت أعلى (< ٠,٠٥ ، أو ٠,٠١) إنتاج وعدد بيض تلاها البيو-نوترا والدينافيرم خلال كل فترات التجربة. وزن البيضة وكتلة البيضة زادت معنويا (< ٠.٠٥) في دجاج السلام عن المندرة فيما عدا الفترة من ٣٣-٣٦ أسبوع. أوزان البيض كان متماثلا في كل المعاملات التجريبية بينما كتلة البيضة في معاملة الفلافوميسين أو البيو-نوترا كانت أعلى معنويا (< ٠,٠٥ ، أو ، ٠,٠١) عنها في الدينافيرم من ٣٣-٤٠ أسبوع.

لم يظهر وزن المح أو القشرة أو سمك القشرة أي اختلاف معنوي بتأثير السلالة أو المعاملات فيما عدا سمك القشرة في طيور المندرة والتي كانت أعلى (< ٠,٠٥) عنها في السلام. سجلت طيور السلام المعاملة بالبيو-نوترا سمك قشرة أعلى عن مجموعة الكنترول. نسبة الخصوبة والفقس كانت أعلى معنويا (< ٠,٠٥) في سلالة الم

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رة عنها في السلام بينما انخفض وزن الكتكوت عند الفقس معنويا (< ٠,٠٥) في سلالة المندرة. سجلت الطيور المعاملة بالبيو-نوترا أعلى نسب خصوبة وفقس (< ٠,٠١) بينما انخفضت هذه النسب في تلك المعاملة بالفلافوميسين والدينافيرم. لم يتأثر وزن الكتكوت عند الفقس بالمعاملات التجريبية.

استهلاك العلف كان متماثل في السلالتين من ٣٣-٤٠ أسبوع بينما كان استهلاك العلف وكفاءة الغذاء أحسن معنويا (< ٠,٠٥) في سلالة السلام عن المندرة خلال الفترات التجريبية الأخرى. استهلاك الغذاء زاد معنويا (< ٠,٠٥) في المجا ميع التجريبية عن مجموعة المقارنة وأظهرت معاملة الفلافوميسين والبيو-نوترا أحسن كفاءة غذائية.

لم تتأثر الصفات السابقة بالتداخل بين السلالة والمعاملات التجريبية فيما عدا وزن البيضة من ٢٩-٣٢ أسبوع وسمك القشرة الذي تأثر معنويا (< ٠,٠٥).

تحسنت معاملات الهضم لكل المركبات الغذائية في سلالة السلام عنها في المندرة – كذلك أثرت المعاملات التجريبية والتداخل بينها وبين السلالة معنويا (< ٠,٠٥) على معظم معاملات الهضم للمركبات الغذائية. كانت أعلى معاملات الهضم في معاملات الفلافوميسين والبيو-نوترا بينما كانت أقلها في معاملة الدينافيرم مقارنة بمجموعة المقارنة.

الكفاءة الاقتصادية كانت أعلى في سلالة السلام عنها في المندرة (+ ٧,٨%) وسجلت معاملة الفلافوميسين أعلى كفاءة اقتصادية تلاها معاملة البيو-نوترا (+ ١٠٦,١ % & + ٦٦,١% على التوالي).