Egyptian J. Anim. Prod. (2013) 50(2):111-115

EFFECT OF DRIED YEAST (*Saccharomyces cerevisiae*) SUPPLEMENTATION AS FEED ADDITIVE TO LAYING HEN DIET ON EGG PRODUCTION, EGG QUALITY, CARCASS TRAITS AND BLOOD CONSTITUENTS.

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SUMMARY

This study was conducted to investigate the effect of different levels of yeast supplementation to laying hen diet on egg production, egg quality, carcass traits and blood constituents. One hundred and eight 26-weeks old, commercial Hy-line Brown hens were randomly assigned into 3 groups, (six replicates of six birds each). The basal diet was formulated to meet requirements of layers and supplemented with dried yeast (Saccharomyces cerevisiae) at levels of 0, 3 or 6 g / kg feed and fed for four months.

Results showed that yeast supplementation at levels of 3 or 6 g / kg feed significantly decreased hen/day egg production, egg number and feed consumption. Dried yeast at 6 g /kg diet tends to decrease live weight, heart weight and plasma total protein. In conclusions yeast supplementation significantly increased shell thickness and improved shell% and yolk. Meanwhile, haugh unit, albumin, egg shape index and yolk index did not significantly affect.

***Keywords*: Laying hens, yeast, performance, blood constituents, carcass traits, egg quality**

INTRODUCTION

Feed additives were used in poultry industry for different purposes, for example to increase performance and decrease mortality rate. These additives include probiotics, coccidiostates and etc. (Afshare - Mazandaran and Rajab, 2001 and Panda *et al*., 2000). Probiotics are live microorganisms that, when administered through the digestive tract, have a positive impact on the host's health. Microorganisms used in animal feed are mainly bacterial strains belonging to different genera, e.g. *Lactobacillus*, *Enterococcus*, *Pediococcus* and *Bacillus.* Other probiotics are microscopic fungi, including *Saccharomyces* yeasts. Some probiotic microorganisms are normally resident in the digestive tract, while others are not (Guillot, 2009). Yousefi and Karkoodi (2007) studied the effect of the addition of different levels of probiotic (0.05, 0.1 and 0.15%) and *Saccharomyces cerevisiae* (0.05, 0.1 and 0.15%) to laying hens diet at 63 week of age. The results showed that body weight changes, feed intake, feed conversion ratio, egg production, egg weight, shell percent and albumin weight did not indicate any treatment effect (P>0.05). However; shell weight, shell thickness, yolk weight and yolk cholesterol was significantly different among treatment groups. Yolk cholesterol was lower in some treatments compared to the control. Yalcin *et al.* (2008b) investigated the effects of yeast culture (*Saccharomyces cerevisiae*) at levels 0 and 2g/kg supplemented to Lohman Brown laying hen (21 wk of age) diets containing two oilseed meals and fed for 16 wk on performance, egg traits, and some blood parameters. They found that yeast culture supplemented to diets containing oilseed meals did not significantly affect feed intake, hen-day egg production, feed efficiency, interior and exterior egg quality characteristics, and serum levels of total protein, triglycerides, cholesterol, alanine amino transferase, aspartate amino transferase, and alkaline phosphatase. However, body weight gain, egg weight, and serum uric acid were increased with yeast culture supplementation. The reduction in egg yolk cholesterol was significant in the groups fed yeast supplemented diets.

Working on laying hens, Dizaji and Pirmohammadi (2009) determined the effect of dietary probiotic containing Saccharomyces *cerevisiae* on body weight, daily feed consumption, egg production, egg weight, egg mass and feed conversion. In 10 weeks experimental period, hens (46 to 55 weeks of age) were allocated to four dietary treatments (0, 200, 300, 400g *Saccharomyces cerevisiae*/ton of diet). Using yeast caused significant improve in feed conversion and significant decrease in egg weight, however, it had no significant effect on the other parameters.

Yalcin *et al*. (2010) determined the effects of yeast autolysate (*Saccharomyces cerevisiae*, Inte Wall) at levels of 1, 2, 3 and 4 g kg^{-1} in the diets of Hyline Brown laying hens, 22 weeks of age. Dietary treatments did not significantly affect body weight, feed intake and egg traits. Yeast autolysate supplementation increased egg production, egg weight, and feed efficiency but, decreased egg yolk cholesterol, blood serum cholesterol and triglycerides, and increased antibody titres to sheep red blood cells. Total saturated fatty acids and the ratio of unsaturated/saturated fatty acids increased and monounsaturated fatty acids decreased with yeast autolysate supplementation. This study aimed to investigate the effect of dried yeast supplementation to the diet of commercial laying hens (Hy-line brown) on performance, egg quality, carcass traits and some blood constituents

MATERIALS AND METHODS

Management and Feeding

This study was carried out at the Poultry Research Farm, Faculty of Agriculture, South Valley University, Qena, The trial was conducted for four months between January, 2010 and April, 2010 in controlled closed system house. One hundred and eight 26-weeks old, commercial Hy-line Brown hens were randomly assigned into 3 groups, each group contains six replicates of six birds per each. Each replicate was kept in wire cage of 61 x 55 x 45 cm. The basal diet (Table 1) was formulated to meet requirements of layers according to NRC (1994), and supplemented with dried yeast (*Saccharomyces cerevisiae* **)** at three levels being 0, 3 or 6gm /kg feed.

Table 1. Composition and calculated analysis of the basal diet

Ingredients	%
Yellow corn	61.50
Soy bean meal (44%)	20.00
Corn gluten meal (60%)	7.00
Wheat bran	0.45
Vit. & Min. premix*	0.30
Dicalcium phosphate	1.36
Calcium carbonate	8.95
NaCl	0.40
DL-methionine	0.04
Total	100
Calculated analysis:	
ME (Kcal/Kg)	2766
Crude Protein (%)	18.45
Crude fiber (%)	2.82
Calcium (%)	3.80
Phosphours (%)	0.62

Each diet was supplied with 3 kg/ton Vit. & Min. Mix (commercial source B. p. Max) Each 3 kg contains, Vit. A 10, 000,000 MIU, Vit. D 2, 000,000 MIU, Vit. E 10000 mg, Vit. K3 1000 mg, Vit. B1 1000 mg, Vit. B2 5000 mg, Vit. B6 1500 mg, Biotin 50 mg, BHT 10000 mg, Pantothenic 10000 mg, folic acid 1000 mg, Nicotinic acid 30000 mg Mn 60 g, Zinc 50 g, Fe 30 g, Cu 4 g, I 3 g, Selenium 0.1 g and Co 0.1 g.

Measurements

The hen performance of the experimental groups was determined through evaluating the feed intake, feed conversion ratio, egg weight and egg number. Egg quality was estimated by measuring shape index, shell thickness, yolk index, and percentage of shell, yolk and albumen as well as Haugh Unit using egg samples obtained from each replicate on the last three successive days of each month.

Blood samples were collected from brachial vein of 18 hens randomly chosen from each treatment (three from each replicate) at the end of the experiment and centrifuged at 3000 rpm for 20 minutes. Serum was collected and stored at −20°C for determination of total protein (TP), albumen (Alb), globulin (Glo), albumen/ globulin ratio (AGr), triglycerides (Tri), total cholesterol (Tchol), glucose (Gluc), alanine amino transferase (ALT), aspartate amino transferase (AST), alkaline phosphatase (ALP ,calcium (Ca) and phosphorus (p) using commercial kits. At the end of the experiment, six hens from each treatment representing the average body weight of each treatment were slaughtered. After slaughtering and complete bleeding, the birds were scalded and feathers were mechanically plucked. Carcass was eviscerated then; feet, head, neck and shanks were removed. Then the carcasses were immediately weighed to obtain post-slaughter carcass weight without giblets. Giblets (included liver, heart and gizzard) as well as abdominal fat, ovary and oviduct were weighed. Also, oviduct length and intestine length were measured.

Statistical Analysis

Data were analyzed using the general linear model procedure of SAS User's Guide (SAS Institute, 2005). Significant treatment effects were detected by Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Productive performance

As shown in Table(2), there were significant decreased ($P \leq 0.05$) in hen-day egg production and egg number, as dietary dried yeast supplementation.

However, there were no significant effects ($P \geq 0.05$) on egg weight, egg mass and feed conversion ratio due to yeast supplementation compared to the control. Average feed consumption of the control group was significantly ($P<0.05$) higher compared to those hens fed diet supplemented with either 3 or 6 g yeast/kg diet. The presented data agree with those of Hewida *et al*. (2011) who reported that increased levels of yeast culture supplementation significantly decreased hen-day egg production. Hosseini *et al*. (2006) found that the addition of live yeast had no positive effect on egg production, egg weight, egg mass, but it had significant effect on feed conversion at 25-78 weeks. On the other hand, other studies reported an improved egg production ($P<0.05$) due to yeast culture supplementation (Abou El-Ella *et al.*, 1996 and Liu and Yoon, 2002). Supplementation of yeast at 2 kg/ton feed (0.2%) resulted in a significant increase ($P<0.05$) in egg weight and consequently increased egg mass. Liu and Yoon (2002) and Nursoy *et al*. (2004) reported no effect of dietary yeast culture on feed consumption, egg production, egg weight, and feed efficiency in laying hens. In this connection, Dizaji and Pirmohammadi (2009) found a significant improve in feed conversion and a significant decrease in egg weight, without significant effect on the other parameters, due to supplementing *Saccharomyces cerevisiae* at 0, 200, 300 and 400 g/ton of laying hen diet.

The cause of no benefit of dried yeast supplementation on performance of laying hens may be due to excess of yeast with normal levels of vitamin mixture resulted in negative interaction or, it's returned to birds, diets, methods and the chemical composition of dietary ingredients that include soybean meal and yellow corn with low fiber content so, dried yeast did not affect hen performance because it needs the diet to contain high fiber content to encourage microbial digestion by increasing flora in laying hen gut.

Table 2. Effect of dried yeast supplementation on performance of laying hens

	Control	T_1 (3 g yeast /kg)	T_2 (6 g yeast /kg)	P value
Hen-day egg prod%.	65.22[a] ±0.43	60.08[b] ±0.37	61.83[b]±0.43	0.0449
Egg number/hen%	78.26[a] ±0.65	72.10[b] ±0.57	74.20[b] ±1.31	0.0449
Egg weight (g)	58.13±0.59	57.43±0.34	57.15±0.44	0.4433
Egg mass /hen (g)	45.49±15.98	41.41±3.23	42.41±7.39	0.3194
Feed consumption (g/hen)	130.47[a] ±10.55	125.06 [b]±17.77	124.69 [b]±15.40	0.0386
Feed conversion(g/g)	2.87±0.13	3.02±0.02	2.94±0.06	0.4557

a, b means within row at each criterion bearing different superscripts are significantly different (P ≤0.05)

Carcass traits

Data presented in Table (3) showed that yeast supplementation to laying hens diet at the level of 6 g/kg diet significantly decreased live body weight and weight of heart compared with the control and T1. This may be returned to low energy level and high protein value for a period of experiment and the decrease in feed consumption. These results disagree with those of Yalcın *et al*. (2008b) who found that body weight increased with yeast supplementation. However, there were no significant differences in the other studied carcass traits and not due to yeast treatment.

Egg quality

Results in Table (4) showed that feeding diets supplemented with dried yeast at levels of 3 or 6 g/kg diet had significantly increased (P ≤0.05) shell thickness, however, there were no significant differences between treatments regarding shell %, HU, yolk%, egg shape index and yolk index. On the other hand, dried yeast supplementation at 3 or 6 g/kg diet tends to decrease albumin % as compared to the control hens. These results are in agreement with those of Yalcin *et al*. (2008b) who found that yeast culture did not significantly affect interior and exterior egg quality characteristics. However, Hosseini *et al*. (2006) found that the addition of live yeast at levels of 0. 0.25, 0.50, 0.75 and 1g live yeast / kg feed had no positive effect on egg shell thickness and egg shell strength at 25-32 weeks, while Haugh unit was higher than the control at all experimental periods. Also, Yousefi and Karkoodi (2007) studied the effect of the addition of different levels of probiotic (0.05, 0.1 and 0.15%) and *Saccharomyces cerevisiae* (0.05, 0.1 and 0.15%) to laying hens diet at 63 week of age. Their results revealed that shell percent and albumin weight did not indicate any treatment effect (P>0.05). While shell weight, shell thickness, yolk weight and yolk cholesterol were significantly different among the treatment groups.

Table 3. Effect of dried yeast supplementation on carcass characteristics of laying hens

Item	Live weight (g)	Ovary weight (g)	Oviduct weight (g)	Oviduct length (cm)	Intestine length (cm)	Liver weight (g)	Gizzard weight (g)	Heart weight (g)	Abdominal fat (g)
C	1720 ± 25.37[a]	43.63 ± 4.61	68.71 ± 5.35	61.83 ± 0.83	153.00 ± 3.36	39.32 ± 3.07	33.82 ± 2.67	7.44 ± 0.63 [a]	25.66 ± 2.41
T1	1652. ± 39.63[a]	45.69 ± 3.15	69.36 ± 5.49	59.33 ± 1.52	160.33 ± 6.51	35.28 ± 2.88	33.99 ± 4.02	7.07 ± 0.22 [a]	22.09 ± 4.03
T2	1532. ± 5.89 [b]	43.98 ± 5.89	68.79 ± 6.81	59.83 ± 0.87	152.16 ± 10.02	30.79 ± 2.03	27.26 ± 1.20	5.11 ± 0.16 [b]	17.95 ± 3.45
P value	0.0121	0.9467	0.9964	0.2785	0.6821	0.1159	0.2030	0.0019	0.2982

a, b means within row at each item bearing different superscripts are significantly different (P ≤0.05) .

Table 4. Effect of dried yeast supplementation on egg quality of laying hens

	C	T1	T2	P value
Shell %	14.09 ±0.22	15.13 ±0.48	14.13 ±0.27	**0.0636**
Shell thickness (μm)	373.50 ±4.61 ^{b}	390.94 ±4.91 ^{a}	378.33 ±5.21 ^{ab}	**0.0428**
Haugh unit	88.89 ±1.09	87.65 ±0.92	87.54 ±1.08	**0.5968**
Albumin %	62.17 ±0.28 ^{a}	60.56 ±0.62 ^{b}	61.80 ±0.47 ^{ab}	**0.0547**
Yolk %	23.72 ±0.22	24.29 ±0.29	24.06 ±0.28	**0.3181**
Egg shape index	80.18 ±0.40	81.38 ±0.38	80.21 ±0.59	**0.1319**
Yolk index	21.53 ±0.23	21.23 ±0.54	20.76 ±0.25	**0.3454**

a, b means within row at each item bearing different superscripts are significantly different (P ≤0.05)

Blood measurements

The data in (Table 5) revealed that dried yeast supplemented at the levels of 3 and 6 g/kg feed did not significant effect on blood measurements except TP, which was increased probably due to the improvement in protein's metabolism. These results agree with the results of Yalcin *et al.* (2008 a) who studied the effects of yeast culture supplementation to laying hen diets containing soybean meal or sunflower meal and showed that neither AST nor ALT were affected. Yalcın *et al*. (2008b) found that yeast culture (*Saccharomyces cerevisiae*) supplementation at 2 g/kg of Lohmann Brown laying hen (21 wk of age) diets containing 2 oilseed meals and fed for 16 wk did not significantly increase serum levels of total protein, triglycerides, cholesterol, alanine amino transferase, aspartate amino transferase, and alkaline phosphatase. Also, Hewida *et al*. (2011) reported that the effect of yeast culture supplementation on blood constituents was not seen for total protein, albumin, globulin and creatinine. Moreover, Ghally and Abd El-Latif (2007) revealed that Japanese quail fed diets contained yeast culture at levels of 1 or 2% showed an improvement in total protein, albumin, globulin, GOT and GPT of blood plasma when birds fed dietary yeast.

CONCLUSION

Dried bakery yeast supplementation to laying hen diet did not improve laying hen performance except feed consumption, carcass weight and heart weight only at 3g/kg. However, plasma total protein, egg shell, albumen, yolk percentage, shell thickness and yolk index were positively affected by yeast supplementation. Yeast supplementation at levels 3 or 6 g/kg feed to low energy level and high protein value diet for a period of 4 months experiment diet did not improve most hen performance terms.

Table 5. Effect of dried yeast supplementation on blood parameters of laying hens

Groups	TP (g/dl)	Alb (g/dl)	Glob (g/dl)	A/G	T. choles (mg/dl)	Glucose (mg/dl)	AST (U/l)	ALT (U/l)	TG (mg/dl)	Ca (mg/dl)	P (mg/dl)
C	3.51 ± 0.07 ^{ab}	1.25 ± 0.06	2.26 ± 0.10	0.50 ± 0.03	117.33 ± 2.26	186.16 ± 1.66	57.16 ± 1.19	12.55 ± 0.53	126.00 ± 0.85	11.13 ± 0.17	5.40 ± 0.08
T1	3.58 ± 0.03 ^{a}	1.35 ± 0.02	2.23 ± 0.02	0.57 ± 0.02	117.33 ± 1.62	186.33 ± 0.95	58.83 ± 1.95	13.05 ± 0.56	127.16 ± 0.47	11.38 ± 0.07	5.53 ± 0.11
T2	3.36 ± 0.05 ^{b}	1.28 ± 0.06	2.08 ± 0.10	0.47 ± 0.04	121.00 ± 1.82	186.83 ± 1.44	58.00 ± 2.09	13.71 ± 0.39	124.83 ± 1.13	11.53 ± 0.08	5.36 ± 0.24
P value	0.037	0.398	0.298	0.173	0.325	0.939	0.808	0.286	0.197	0.087	0.756

a, b means within column at each item bearing different superscripts are significantly different (P ≤0.05) .

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تأثير إضافة الخميرة الجافة (خميرة الخباز) إلى عليقة دجاج البيض على الأداء الإنتاجى، جودة البيض، خصائص الذبيحة و مكونات الدم

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أجريت هذه الدراسة لبحث تاثير اضافة مستويات مختلفة من الخميرة الى علف الدجاج البياض على انتاج البيض و جودة البيض و صفات الذبيحة و مكونات الدم . إستخدم فى الدراسة عدد 108 دجاجة بياضة من سلالة الهاى لاين البنى التجارية عمر 26 أسبوع وقسمت عشوائيا إلى 3 مجموعات ضمت كل منها 6 مكررات بكل مكرر 6 دجاجات بياضة . تم تكوين العليقة الأساسية لتقابل احتياجات دجاج البيض و اضيف اليها الخميرة الجافة تحت مستويات صفر و 3 و 6 حم / كجم علف لمدة اربع شهور .

أظهرت النتائج أن إضافة الخميرة الجافة بمستويات 3 ، 6 جم/كجم علف أدى إلى إنخفاض معنوى لكل من إنتاج البيض ، عدد البيض ، إستهلاك العلف. إضافة الخميرة الجافة بمستوى 6 جم/كجم يميل إلى خفض الوزن الحى ، وزن القلب ، البروتين الكلى فى بلازما الدم . يستنتج من ذللك ان إضافة الخميرة ادت الى تحسين معنوى فى سمك القشرة وحسنت النسبة المئوية للقشرة والصفار بينما لم تتأثر معنوى ارتفاع البياض والالبيومين ودليل شكل البيضه ودليل الصفار.