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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 9 (12): 2346-2349, 2006
ISSN 1028-8880
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Study on the Effect of Yeast (*Saccharomyces cerevisiae SC47)* Utilization on the Commercial Layer Hen's Performance

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Abstract: A trail was conducted to investigate the effect of yeast (*Saccharomyces cerevisiae SC47)* utilization on the commercial layer hen's performance. The experiment consisted of 5 diets (0, 0.25, 0.5, 0.75 and 1 g Yeast per kg diet) with five replicates each containing 15 laying hen's hy-Line W36 from 25 to 78 week of age. The randomized complete design was used for this experiment. During the experiment egg weight, egg production (%), Egg Mass, feed conversion and egg quality were measured daily and every month, respectively. The data analyzed in five periods (25-32, 33-44, 45-58, 59-78 and 25-78 week). The result showed that using Yeast had no positive effect on feed intake in all of the periods ($p<0.05$). Duncan test showed that feed intake in 59-78 weeks for group of 3 (0.5 g kg^{-1} Yeast) was higher (102.06 g) than other groups. Egg production and average egg weight didn't affected by using Yeast, but in 25-78 weeks, egg production in 4 and 5 treatments was 2.43 and 2.06% higher then control groups, respectively. In all of the periods egg mass in groups of 4 and 5 was higher than control but only in 59-78 weeks this difference was significant. In this period egg mass in 4 and 5 treatments was 6.98 and 8.42% higher than control. Yeast had no positive effect on feed conversion, but the group of 5 (1 g kg^{-1} Yeast) had a best feed conversion. Addition of Yeast in Commercial Layer hen diet was no effective on egg specific gravity, eggshell thickness, haugh unit, egg breaking strength and eggshell quality ($p<0.05$). Egg special gravity in group 2 was higher than group 3 ($p<0.05$). Haugh unit in group 5 was higher than other groups in all of the periods but this difference in 25-32 and 59-78 weeks was significant ($p<0.05$). The food intake cost in 25-78 weeks was 21, 11.9 and 17.65 Rials less for each kg egg in groups 3, 4 and 5, respectively.

Key words: Yeast, *Saccharomyces cerevisiae* SC47, layer hen- performance, egg quality

INTRODUCTION

The use of probiotic (direct-fed microbials, DFM) as a substitute for antibiotics in poultry nutrition has become an area of great interest (Jin *et al*., 1997). Continued use of sub therapeutic levels of antibiotics in animal feeds may result in the presence of antibiotic residues in animal products and the development of drug-resistant micro-organisms in humans (Jin *et al*., 1997). To achieve high levels of economic efficiency poultry are raised under intensive production systems in densely populated colonies or flocks. The chickens are stressed by various factors such as transportation to the growing site, overcrowding, vaccination, chilling and/or overheating. These tend to create an imbalance in the intestinal micro flora and a lowering of body defense mechanisms. Under such circumstance, antimicrobial feed additive such as antibiotics and synthetic microbial agents are often used to suppress or eliminate harmful organisms in the intestine and to improve growth and feed efficiency. The use of antibiotics as routine feed additives has been banned in some countries because of public concern over possible antibiotic residual effects and the development of drug-resistant bacteria (Jin *et al*., 1997).

Besides lactic acid production bacteria, yeast and fungi are also used as probiotic additives in poultry (Fox, 1988; Montes and Pugh, 1993; Kautz and Arens, 1998). Line *et al.* (1998) observed reduced colonization of *salmonella* in the ceca of yeast- treated broilers while *Campylobacter* colonization was not prevented.

The use of yeast culture has been reported to release 75 to 80% of phytate phosphorous within 4 h *in vitro* and to utilize phosphorous efficiently in phosphorus-deficient diet fed to growing chickens (Thayer and Jackson, 1975). Thayer *et al.* (1978) reported an improvement in egg production, egg weight and egg specific gravity for turkey breeder hens fed diets containing low phosphorous level and lives yeast culture. In another research the application of the probiotic Babybiol F23 in feeding laying hens was investigated by Svetic *et al.*

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(1994). Babybiol was a mixture of *Saccharomyces cereviciae*, *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. The results showed that using probiotic improves egg production (%), egg weight and feed conversion and it's reducing the number of eggs with damaged shell. On the contrary, the addition of live yeast culture was not effective on egg production, mortality, egg weight and egg shell weight in broiler breeders, (Brake, 1990) and in laying hen (Day *et al*., 1987).

There was a difference between the result of experiment that used yeast in layer diets as a probiotics and its maybe because of using yeast in a different phase of egg production. In this experiment we try to use yeast in a complete egg production phase (25-78 weeks) of layers.

MATERIALS AND METHODS

The study was conducted with white Leghorn hens (Hy-Line W36), aged 25 to 78 weeks. Fifteen week old poult were bought from a farm, raised until 18 weeks in closed poultry house and then transferred to an open shaded poultry house and kept in individual cages. At the age of the 20 weeks the natural day length was artificially increased from 11 h/ day to 16 in peak of egg production and then it maintained constant until the end of experiment.

Two hindered and fifty hens at 25 week of age were selected according to egg production (5-6 egg/week) and weight (1524+5%) and then they were randomized into individual layer cages. Hens were kept in confinement housing under semi controlled environmental conditions. The experiment consisted of 5 diets (0, 0.025, 0.05, 0.075 and 0.1% Yeast in diet) with five replicates each containing 10 laying hens hy-Line W36 from 25 to 78 week of age. In these periods birds fed with 4 diets (Table 1).

Table 1: Experimental diets in different periods of time

	Age of week			
Ingredient	25-32	33-44	45 -58	59-78
Corn	58.45	52.00	51.30	51.00
Soybean meal	23.00	19.00	19.00	19.00
Barely	5.500	15.00	15.00	11.00
Fish meal	1.650	1.250	0.900	2.100
Salt	0.380	0.360	0.355	0.300
Vitamin premix	0.250	0.250	0.250	0.250
Mineral premix	0.250	0.250	0.250	0.250
DL- methionine	0.150	0.104	0.140	0.090
Wheat bran	1.000	1.000	0.500	0.200
Di calcium phosphate	1.180	1.030	0.900	0.700
L- Lysine	-	0.020	-	-
Fat (plant)				
Oysters shell	8.330	8.900	9.300	10.61
Fat (Powder)			2.200	4.500

Vitamin premix Supplied per kg of diet: Vitamin A, 8000 IU; Vitamin D3, 3500 IU, Vitamin E, 70 IU, Vitamin K, 5 mg, Vitamin C, 300 mg, Cholin Chloride, 1000 mg. Mineral premix Supplied per kg of diet: Fe, 250 mg; Cu, 100 mg; Zn, 150 mg; Se, 15 mg and Mn 100 mg

In experimental period egg production, egg weight (g), mortality and feed intake (g) was measured weekly and egg specific gravity, egg shell thickness (mm), egg breaking strength (kg cm^{-2}), egg shell weight (%) and haugh unit were investigated monthly.

Statistical analysis: All of the data were subjected to one- way analysis of variance test. Statistical significance among treatment means were determined by the method of new multiple range test of Duncan (1955) when the F-value was significant at 5% level.

RESULTS AND DISCUSSION

The effects of yeast (Saccharomyces cerevisiae SC47) utilization on the commercial layer hen's performance, at different ages were summarized in Table 2.

Table 2: The effect of yeast (*Saccharomyces cerevisiae SC47*) utilization on the commercial layer hens performance

		Yeast levels (%)					
Age	Variable	0	0.025	0.05	0.075	1	SE
25-32 week	Feed intake (g/day)	95.61	95.93	95.74	96.123	95.90	0.16
	Egg Production (%)	91.58	89.70	90.80	92.05	91.16	0.44
	Average egg weight (g)	53.29	53.84	53.85	53.50	53.93	0.24
	Egg mass (g)	48.80	48.30	48.40	49.25	49.17	0.01
	Feed conversion	1.96	1.988	1.959	1.952	1.954	0.29
33-44 week	Feed intake (g/day)	99.49	99.578	99.18	99.561	99.21	0.10
	Egg production (%)	89.4	87.619	89.94	90.516	89.52	0.53
	Average egg weight (g)	56.98	57.703	57.77	57.3	57.41	0.28
	Egg mass (g)	50.95	50.563	51.96	51.864	51.39	0.33
	Feed conversion	1.954	1.973	1.91	1.92	1.933	0.01
45-58 week	Feed intake (g/day)	97.12	98.33	97.47	99.13	97.09	0.38
	Egg production (%)	81.12	79.15	82.74	83.419	82.77	0.61
	Average egg weight (g)	59.16	59.758	59.35	59.84	59.57	0.13
	Egg mass (g)	48.00	47.309	47.12	49.925	49.30	0.44
	Feed conversion	2.026	2.083	1.987	1.988	1.973	0.02
59-78 week	Feed intake (g/day)	100.23^{ab}	100.87^{ab}	99.205^{b}	102.06^{a}	100.3^{ab}	0.40
	Egg production (%)	70.70	72.441	71.09	74.93	75.542	0.77
	Average egg weight (g)	60.648	61.884	61.614	61.168	61.516	0.29
	Egg mass (g)	42.84^{b}	44.81^{ab}	43.756^{ab}	45.83^{a}	46.447^{a}	0.46
	Feed conversion	2.34^{a}	2.256^{ab}	2.271^{ab}	2.229^{ab}	1.164^{b}	0.02
25-78 week	Feed intake (g/day)	98.504	99.128	98.2	99.745	98.505	0.23
	Egg production (%)	81.053	80.428	81.584	83.479	83.118	0.51
	Average egg weight (g)	58.027	58.919	58.752	58.567	58.883	0.18
	Egg mass (g)	47.03	47.387	47.938	48.894	48.812	0.34
	Feed conversion	2.095	2.094	2.05	2.04	2.02	0.01

Mean within a row followed by different superscripts statistically different at ($p \leq 0.05$)

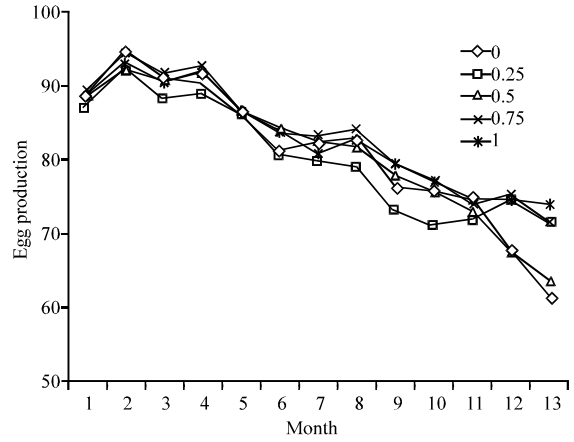

Fig. 1: Egg production in experimental periods

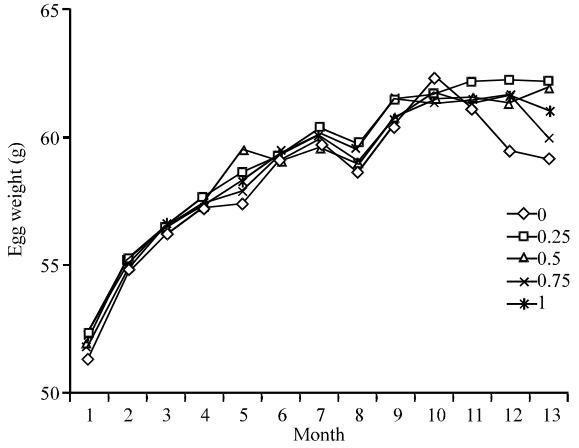

Fig. 2: Egg weight in experimental periods

Table 3: The effect of yeast (*Saccharomyces cerevisiae SC47*) utilization on the eggs quality

Age (week)	Variable	Yeast levels (%) 0	0.025	0.05	0.075	1	SE
25-32	Egg specific gravity	1.092	1.0844	1.1096	1.0906	1.0902	0.004
	Egg shell thickness	0.302	0.296	0.301	0.298	0.296	0.002
	Egg shell strength	2.205	2.057	2.227	2.231	2.158	0.040
	Hugh unit	99.19^{ab}	98.31^{ab}	99.78^{ab}	97.31^{b}	102.24^{a}	0.063
	Egg shell weight (%)	13.038	12.954	12.864	12.881	12.873	0.080
33-44	Egg specific gravity	1.0876	1.0868	1.0854	1.0844	1.0872	0.0007
	Egg shell thickness	0.303	0.296	0.298	0.301	0.296	0.0022
	Egg shell strength	1.855	2.160	1.889	2.188	1.95	0.080
	Hugh unit	96.03	95.31	96.12	94.31	97.26	0.726
	Egg shell weught	13.381	13.392	13.313	13.626	12.951	0.108
44-58	Egg specific gravity	1.0842^{ab}	1.0878^{a}	1.0822^{b}	1.0845^{ab}	1.0846^{ab}	0.0006
	Egg shell thickness	0.284	0.302	0.285	0.288	0.285	0.0026
	Egg shell strength						
	Hugh unit	86.56	85.83	81.96	85.40	86.47	0.865
	Egg shell weight	12.467	12.572	12.203	12.280	12.559	0.102
58-78	Egg specific gravity	1.0844	1.0814	1.0834	1.0832	1.816	0.0007
	Egg shell thickness	0.291	0.290	0.285	0.286	0.289	0.0020
	Egg shell strength						
	Hugh unit	85.43^{b}	85.43^{b}	85.21^{b}	83.56	91.32	0.926
	Egg shell weight (%)	12.830	13.212	12.694	12.559	12.770	0.116

Mean within a row followed by different superscripts statistically different at ($p \leq 0.05$)

Feed intake: The result (Table 2) showed that using SC (*Saccharomyces cerevisiae SC47*) in layer diet had no positive effect on feed intake in all of the experimental periods except 59-79 weeks. In this periods feed intake (g/day) for group 4(0.075% SC) was 2.88% higher than group 3(0.05% SC).

Egg production: There wasn't any significant difference between groups in all of the experimental groups, but group 4 and 5 were 2.426 and 2.065% higher than control group in 25-78 weeks. In addition to when the level of egg production decreased in 58-78 weeks, using SC (in groups 2, 3, 4 and 5 increased 2.46, 0.55, 5.98 and 6.85%) egg production higher than control group. Egg production in controls reduced more rapidly than SC group after 10 month egg production (Fig. 1).

Egg weight: Also there was an increase in egg weight with using SC, but this increasement isn't significant (Fig. 2). For example in 25-78 weeks egg weight for 2, 3, 4 and 5 groups was 1.537, 1.249, 0.93 and 1.2% higher than control.

Egg mass: Table 3 shows that using S.c increase egg mass but its not significant except in 58-78 week. In this period egg mass for group 4 and 5 was 2.99 and 3.61% higher than control. In 25-78 weeks egg mass for SC groups (2, 3, 4 and 5) was 0.36, 0.91, 1.86, 1.78 higher than control, respectively.

Feed conversion: The result showed that using SC can improve feed conversion, although this improvement wasn't significant except in 59-78 weeks. In this period feed conversion for group 5 was the best (2.164). Feed conversion for all of the experiment periods (25-78 week) in groups 3, 4 and 5 in comparison to control was improved by 2.15, 2.62 and 3.58, respectively.

According to this experiment we had found that the result of using SC in layers diet is dependent to age of birds. The result showed that no significant difference

was found in various egg production trait among 5 treatments in 25-32, 33-44, 45-58 and 25-78 weeks, but egg production, egg mass feed conversion improved by using SC.

In the contrast at the age of 59-78 weeks, using SC improved egg mass and feed conversion significantly ($p<0.05$).

Day *et al.* (1987) reported that the use of live yeast culture was not effective on egg production, egg weight and egg shell weight in laying hens. Similar result were observed by Brake (1990) in broiler breeder. Svetic *et al.* (1994) in there experiment used a mixture of *Saccharomyces cerevisiae*, *Lacto bacillus bulgaricus* and *Streptoccus thermophilus* in laying hens and they showed that using this mixture improve egg production, egg weight and decease percentage of eggs with damaged shells and feed intake.

Several authors reported that egg production was significantly increased by supplementing *Lactobacillus* sp. in diet of laying hens (Krueger *et al.*, 1977; Miles *et al.*, 1981; Nahashon *et al.*, 1994).

Egg quality: Using yeast in layers diet had no positive effects on egg specific gravity, egg shell thickness egg shell strength, hugh unit and egg shell weight ($p<0.05$), but group 2 (1.0878) and 3 (1.0822) in 45-58 weeks had high and lowest egg shell gravity respectively. Group 5 had a best hugh unit in all of the experimental periods than controls and other experimental groups.

Brake (1990) noted that using S.C was no effective on egg shell weight. Feeding Fermacto 500 to laying hens was resulted in significant effect on egg quality (Harms and Miles, 1988), however, Grimes *et al.* (1997) reported to the contrary.

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