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The Effect of Adding Different Levels of Saccharomyces Cerevisiae to the Quail Birds Feed or Drinking Water on Characteristics of the Egg Production and the Qualitative Characteristics of Local Quail Eggs

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A B S T R A C T

The aim of this study is to see the effect of adding different levels Saccharomyces cerevisiae to the feed or the drinking water on the characteristics of eggs production and the qualitative characteristics of the local quail eggs. The levels (0, 1, 1.5, 2 and 2.5%) of yeast to the feed and 0.5 g / L in the drinking water for 324 birds as a total number. The birds were randomly distributed into six treatments; each of which included 54 bird/treatment and with 6 replicates (9 birds/replicate). The statistical analysis results showing A significant improvement showed that there was an improvement in the daily production rate of eggs (%H.D.P.), the mass of the egg (g/female bird/week) and the number of the eggs for the treatments characterized with high levels of Saccharomyces cerevisiae in the feed (2 and 2.5% of Saccharomyces cerevisiae in the feed). On the contrary, there was no significant effect on the weight of the average fodder consumed for the treatments that include Saccharomyces cerevisiae compared with the control treatment. Feed conversion ratio rate was improved in the third treatment and was higher compared with the rest of the treatments as its value was (3.17). Yet, there were no significant differences among the rest of the treatment and the control treatment in terms of the coefficient of feed conversion ratio. Moreover, it was observed that there was a significant improvement in the weight of the egg shell and its thickness in favor of the Saccharomyces cerevisiae addition treatments compared with the control treatment. As for the characteristics of the index of yolk, white, hue unit and the shape of the egg, the differences were not significant compared with the control treatment.

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Introduction

In the recent years, antibiotics have been used as food additives for poultry and stimulants of growth to improve the food transformation efficiency and to reduce the economic losses due to the microbes (Mathivanan et. al., 2006). But the excessive use of these antibiotics in terms of feeding the poultry leads to eliminating the harmful and the useful bacteria and decreases the mucous layer that covers the cells walls covering the intestine. This , in turn, make them vulnerable to be infected with pathogenic microbes and result in an imbalance of the intestinal flora and weakening of the immunological system (Green et. al., 2001). Researches have had the tendency to use a blend of organisms with positive effects of the human and domestic animal health (Selective Enrichment) as they cover the receptors of the epithelium cells that cover the digestive tract. And in this way, they prevent the bacteria from adhesion on these cells, exclud them and then cause the positive microbial balance. Thus, they are called the Probiotics (Zinedine et al., 2005). *Saccharomyces cerevisiae* are unicellular organisms that are proliferated by budding. They are gram positive and increase the microbial existence in the digestive tract as they exhaust the oxygen and consequently provide anaerobic environment that help the growth of *Lactobacilli* and *Bacillus Subtilis* bacteria which increase the average growth and promot the efficiency of feed conversion ratio (Mohan et. al., 1995 ; Jin et al., 2000). *Saccharomyces cerevisiae* play a positive role in terms of resisting the diseases caused by several bacteria such as *E.coli*, *Salmonella* and *Clostridia* and Moulds like *Aspergillus Flavus* and *Aspergillus Parasiticus*, and they decrease the mortalities percentage and so improve the production performance of poultry (Perez–Sotelo et al., 2005). Therefore, this study aimed at identifying the effect of using different levels of dry *Saccharomyces cerevisiae* in the fodder or using the liquid one in the drinking water on the productions characteristics and the number of the organisms in the local quail intestine.

Materials & Methods

The present study was conducted on a poultry farm of the department of Animal Resources at the College of Agriculture & Forestry, Mosul University for the period 4/12/2013 – 18/2/2014. In the research, 432 of local quail chicks were used and randomly distributed into six treatments, each of which included 54 birds/treatment and six replicates (9 birds/replicate). Saccharomyces cerevisiae was added to the fodder with levels of zero, 1, 1.5, 2 and 2.5% and 0.5 g/liter to the drinking water. The birds were fed with an unified fodder that contained 20.32% of raw protein, 2846.5 assimilated energy/kg of fodder, 5.46% ether extract, 1.88% raw fibers, 1.12% lycin, 0.83% methonin+cystin, and adding the compound that contained the vitamins and necessary minerals). Moreover, fodder and water were freely provided to the birds. all the birds were put in cages with dimensions of 50 × 50 × 50 cm at the same environmental and veterinary conditions. The following characteristics were studied. The number of eggs were produced by each female quail, egg weight (gram), mass of the egg for each female bird (gram). The daily rate of eggs produced H.D. (%), the quantity of feed consumed (gram) and the Feed conversion ratio coefficient. The characteristics of the egg included: the weight of the shell (gram), thickness of the shell with the membranes (millimeter), index of the white, index and weight of the yolk (gram), the weight of the white, hue unit and the index of the shape). The statistical analysis was conducted using the complete randomized design (C.R.D.) and the averages were compared according to Duncan test in terms of all the characteristics dealt with by the study.

Table (1) shows the basic components of the fodder that was used in this study.

Feed Ingredient	Percentage(%)
Yellow corn	52
Soybean meal (44%)	31
Protein concentrate*	5
Vegetable oil	3
Common Salt	0.3
Limestone	7.5
Dicalcium phosphate	1
Total	100%
Calculated and estimated chemical composition of the diets %	
Assimilated energy/kg	2847.5
Crude protein calculated	20.32
Ether extract estimator	5.46
raw fibers estimator	1.88
Methionine +Cystine	0.83
lysine	1.12

Reference was prepared by the researcher based on the statistical analysis program SAS

Results & Discussion

First: The production characteristics

Table (2) shows the superiority of all the treatments that contained Saccharomyces cerevisiae in terms of the number of eggs produced by female birds compared with the fodder of the control treatment. The highest number of eggs per a female bird was for the fourth and the fifth treatments (2 and 2.5% of Saccharomyces cerevisiae added) as the values were (5.89 and 5.90) egg/female bird/week. And these two treatments were not significantly different from the rest of the treatments that included (1, 1.5 and 0.5%) of Saccharomyces cerevisiae added to the drinking water. On the other hand, the lowest average of eggs produced was for the birds of the first treatment (the control treatment) to which no Saccharomyces cerevisiae was added and the value was (5.18) egg/female bird/week. These results were similar to the results of Al-Azzawi et. al. (2012); Dheyab et. al. (2013) when adding 1.20% of Saccharomyces cerevisiae to the fodder, which resulted in a significant increase in the production of eggs of the quails and also similar to the results of Zangana and Naji (2007). The rise in egg production when adding the Saccharomyces cerevisiae (probiotic) was due to the action of the organisms in the intestine that suppressed the harmful bacteria and stimulate the activity of the beneficial bacteria in the intestine that increased the capacity of making use of the fodder and thus increasing the production (Hassanein and Soliman, 2010). It was also noticed that there were significant differences in the tenth week of the experiment as the superiority was achieved by the third treatment when adding 1.5% of the yeast, followed by the second, sixth, fourth and the fifth treatments compared with the first treatment (the control treatment) as the weights of the eggs produced were (13.2, 12.9, 12,9, 12.8, 12.18 and 12.7) grams respectively. These results were in conformity with the findings of Al-Azzawi et. al. (2012), as they observed an increase in the weight of the eggs when using the yeast in the egg-producing quail birds fodder with percentages of 0.40, 0.80 and 1.2% and these results were also confirmed by Naji and Al-Rawi (2005) when they studied the egg-producing chickens. Hassanein and Soliman (2010) found no significant differences among the weight of quail eggs when they added the yeast to the feed of the egg-producing quails and chickens. Table (2) shows that the high level of Saccharomyces cerevisiae added (2.5%) (the fifth treatment) produced the highest level of egg production which was 84% and which was superior over the first treatment (the control treatment) 74.05% although the general level of egg production for the birds that were fed with fodders to which yeast was added with the levels (1.5, 2, 2.5 and 5) gram of yeast/liter gave a level of egg production that was significantly not different. These results were in conformity with the results of Al-Azzawi et. al. (2012) when they added 1.20% of yeast to the fodders of the egg-producing quail birds and found an increase in the rate of daily egg production based on H.D.P.%. As for Zangana and Naji (2007); Naji and AL-Raqi (2005), they observed that when adding the probiotic that contained *S.cerevisiae* with a ration of 5 kg/ton of fodder, there were significant differences in the daily egg production of chickens. Also, these results were in conformity with what was concluded by Hassanein and Soliman (2010) as they asserted that there was an increase in egg production when adding the yeast and this might be due to the effect of Saccharomyces cerevisiae against the action of the harmful intestinal organisms that caused a poor assimilation of the nutrients. So, adding the yeast would increase the digestion and assimilation of the nutrients providing more of them to form the eggs. Also, Soliman (2003) noticed that the increase in the daily egg production when adding Saccharomyces cerevisiae might be due to the decrease of the harmful bacteria reproduction. From Table (2) too, it was noticed that the average mass of the eggs produced (gram/female bird/week) was significantly superior for the third, fourth, fifth and sixth treatments (76.36, 75.15, 75.82 and 67.82 gram/bird) compared with the control treatment and the treatment with the lowest quantity of Saccharomyces cerevisiae (the second treatment) as the values were (65.66 and 67.82) gram/female bird/week respectively. These results were in conformity with what was reported by AL-Azzawi et. al. (2012) as they observed an increase in the egg mass when using 1.20% of Saccharomyces cerevisiae in feeding the quail birds. On the other hand, the results were not in conformity with the findings of Dheyab (2013) as the researcher found no significant differences in the egg mass when adding the water soluble probioticm which contained the S. cerevisiae to feed the quail birds compared with the control treatment. It is worth mentioning here that the egg production rate and the mass of eggs for the total period of study and for the quails that used drinking water to which Saccharomyces cerevisiae was added (the sixth treatment) produced the eggs on the basis of H.D.P.% was not significantly different from the third, fourth and fifth treatments to which (1.5, 2 and 2.5%) of S.accharomyces cerevisiae were added and this results is interesting in terms of adding the Saccharomyces cerevisiae to the drinking water of the birds. There were no significant differences among all the experimental groups in terms of the quantities of fodder consumed. These results are not in agreement with the results of AL-Noori et. al. (2008), who noticed a significant decrease in fodder consumption when adding the probiotic that contains S.cerevisiae in the feeds of egg-producing chickens (Essa Brown) with a rate of 3, 5 and 7 kg/ton of fodder. The feed consumption rates were approximate for all the groups of birds that were fed with different levels of Saccharomyces cerevisiae compared with the control treatment. This result is in agreement with the results of Shanoon et. al. (2013) and Al-Azzawi et. al. (2012) who found no significant differences in terms of feed consumption when adding 5, 10 and 15 g/kg to the quail feeds. It is clear from the table that there were no significant differences in terms of the levels of yeast used in all the fodders for the total period of study among the values of feed conversion ratio. It was noticed that the fodder that contained 1.5% of S. cerevisiae achieved the best feed conversion ratio coefficient for egg production for the total period with a value of (3.17) and this treatment was superior over the control treatment (3.50) and followed the treatment with 0.5%g/l of drinking water (3.22), which was superior over the rest of the treatments (the second, the fourth and the fifth). The improvement in the Feed conversion ratio coefficient in the experimental treatments might be due to the increase of the number of useful bacteria in the intestinal flora of the digestive track because the yeast was added and the yeast leads to morphological changes in the digestive track like the length and depth of villi and increasing the surface area that assimilates the nutrients more and making use of the feed in a better way. Hamad and Fields (1979) found that the S. cerevisiae yeast acts to increase the microbes' presence in the digestive track by means of consuming the oxygen and eventually providing an anerobic environment that enable the *Lactobacilli*, *bacillus and Subtilis* bacteria to grow and increase the productivity of the birds and rising the efficiency of the Feed conversion ratio (Mohan et al., 1995 and Jin et al., 2000). On the other hand, Bradley and Savage (1995) reported that there was an improvement in energy utilization when the birds were fed with feed that contained Saccharomyces cerevisiae, while Soliman (2003) asserted that adding Saccharomyces cerevisiae to the fodder of egg-producing chickens significantly improved the protein digestion coefficient. On the other hand, the improvement observed in the Feed conversion ratio coefficient when yeast was added as a liquid in the drinking water might be because the yeast added to the water took longer time in the digestive track and there the capability of the quails to make use of the this yeast was more compared with the similar levels of the dry yeast added to the fodder and thus the productive performance improved. This is what was asserted by Channber et. al. (1997) in their research of the broilers.

Tables 2. The effect of adding S. cerevisiae to the feed or to the drinking water on the production characteristics of the local quails with an age of (10) weeks

Teatments / Characteristics	First treatment (control)	Second treatment, (1%) dry yeast	Third treatment, (1.5%) dry yeast	Fourth treatment, (2%) dry yeast	Fifth treatment, (2.5%) dry yeast	Sixth treatment (0.5 g/l) liquid yeast
Eggs produced/ female quail	5.18 ± 0.26 B	5.25 ± 0.25 AB	5.79 ± 0.24 AB	5.89 ± 0.07 A	5.90±0.08 A	5.67 ± 0.23 AB
Egg weight (g)	12.7 ± 0.29 A	12.9 ± 0.23 A	13.2±0.22 A	12.8 ± 0.25 A	12.8 ± 0.23 A	12.9 ± 0.21 A
Egg mass (g of egg /female quail)	65.66 ± 4.34 B	67.82 ± 4.36 B	76.36 ± 4.45 A	75.15 ± 0.95 A	75.82 ± 2.29 A	73.34 ± 4.10 A
Percentage of eggs daily production	74.05± 3.79 B	74.94±3.58 B	82.45 ± 3.43 A B	81.01 ± 2.97 AB	84.03 ± 1.32 A	80.76 ± 3.14 A B
Feed consumed (g)	230.12 ±20.84 A	223.50± 25.19 A	241.88± 30.55 A	250.97± 23.12 A	253.84± 34.42 A	236.20± 28.61 A
Feed conversion ratio Coefficient (g)	3.50 ± 0.21 A	3.30 ± 0.43 AB	3.17 ± 0.40 B	3.34 ± 0.32 AB	3.36 ± 0.42 AB	3.22 ± 0.40 AB

Reference: Prepared by the researcher based on the statistical analysis program SAS

Values with different letters within one column refers to significant differences at the level of likelihood (0.05 ≥ A)

Second: The qualitative characteristics of the eggs

From Table (3), it is observed that there were significant differences in the weight of the egg shell among the treatment with various levels of yeast added to the feed or to the water as it was found that the treatments involved high levels of yeast (2 and 2.5% in the feed or 0.5 gram/liter in the drinking water) produced the highest weight of egg shell with values (1.21, 1.26 and 1.20 g) respectively compared with the control treatment (1.08 g), which was not significantly different from those which include (1 and 1.5% of yeast). As for the thickness of the egg shell, the treatment that contained (2%) yeast, with a value of (0.29 mm) was significantly superior compared with the control treatment feed (0.25 mm), though there were no significant differences in the egg shell thickness for the treatments that contained different levels of yeast added to the feed or to the drinking water. The improvement in the weight and thickness of the shell related to adding yeast at the high levels to the feed might be due to the improvement of absorbing the calcium and raising the capability of birds to preserve. Park et.al. (2001) confirmed that feeding the birds (egg producing chickens) with fodder that includes S.cerevisiae led to producing more hard eggs and decreases the rate of the broken eggs compared with the control treatment. Thayer et. al. (1978) indicated that the cultures of S.cerevisiae could increase the benefit of the organic phosphorus for

Turkeys. Griggs and Jacob (2005) demonstrated that the Phytase yeast enzyme has the potential to increase the availability of some elements like the calcium, copper, zinc, iron and the manganese and increase the gross energy. However, these results are not in conformity with what was found by Dheyad (2013), Shanoon et. al. (2013) and Al-Azzawi et. al. (2012) when they added S.cerevisiae to the feed or to the drinking water of the egg-producing quails as they noticed no significant differences in the egg shell weight. Despite that, the results were confirmed by Zangana and Naji (2007), Hassanein and Soliman (2010), Al-Noori et. al. (2008), Yousefi and Karkoodi (2007), Aynawale et. al. (2006) and Mahdavi et. al. (2005) who studied the effect of adding the probiotic (that contains S.cerevisiae) on the nutrition of chickens and they found no significant differences in the shell weight. As for the characteristics of the indices of the white and the yolk, the weight of yolk and the weight of the white, the shape index and hue unit, the statistical analysis results showed no significant differences among the various treatments as the results were approximate to the results of the control treatment. These results were similar to the ones reached by Dheyab (2013), Shanoon et. al. (2013) and AlAzzawi et. al. (2012) who studied the egg-producing quail and similar also to the results of Zangana and Naji (2007), Hassanein and Soliman (2010), Al-Noori et. al. (2008), Yousefi and Karkoodi (2007), Ayanqwale et. al. (2006) and Mahdavi et. al. (2005) who studied the egg-producing chickens. Moreover, these results were not in agreement with the findings of Al-Azzawi et. al. (2012) who noticed a significant increase (0.05) in the weight of the yolk when adding 1.20% of S.cerevisiae.

Table 3. The effect of adding S. cerevisiae to the feed or to the drinking water on the qualitative characteristics of quail eggs with an age of (10) weeks

Characteristic / Treatments	Egg shell weight (g)	Shell thickness with the membrane (mm)	White index	Yoke index	Yoke weight (g)	White weight (g)	Hue unit	Shape index
Treatment 1 (control)	1.08± 0.02 B	0.25± 0.01 B	5.61± 0.02 A	0.55± 0.008 A	4.32± 0.06 A	7.84± 0.13 A	68.88 ±0.06 A	79.20 ±0.70 A
Treatment 2 (1%) dry yeast	1.17± 0.02 AB	0.26± 0.01 AB	5.72± 0.02 A	0.55± 0.009 A	4.27± 0.11 A	7.64± 0.26 A	68.52 ±0.62 A	79.17 ±0.58 A
Treatment 3 (1.5%) dry yeast	1.17± 0.03 AB	0.26± 0.01 A B	5.60± 0.01 A	0.53± 0.01 A	4.19± 0.12 A	7.86± 0.18 A	68.9± 1 A	78.82 ±0.53 A
Treatment 4 (2%) dry yeast	1.21± 0.03 A	0.29± 0.01 A	5.66± 0.02 A	0.54± 0.007 A	4.14± 0.14 A	8.08± 0.13 A	69.44 ±0.82 A	78.84 ±0.67 A
Treatment 5 (2.5%) dry yeast	1.26± 0.04 A	0.27 ±0.01 AB	5.75± 0.02 A	0.54± 0.01 A	4.21± 0.15 A	8.11± 0.22 A	69.66 ±1.05 A	78.42 ±0.64 A
Treatment 6(0.5 g/l) liquid yeast	1.20± 0.03 A	0.27± 0.01 AB	5.70± 0.02 A	0.55± 0.01 A	4.30± 0.09 A	8±0.12 A	69.56 ±1.65 A	78.78 ±0.64 A

Reference: Prepared by the researcher based on the statistical analysis program SAS

Values with different letters within one column refers to significant differences at the level of likelihood (0.05 ≥ A)

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