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## The Study of the Effect of Adding Different Levels of Saccharomyces Cerevisiae to the Fodder and Drinking Water on the Productive Performance and Intestine Bacteria of the Local Quail

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### ABSTRACT

The current study was conducted in a poultry farm at the College of Agriculture and Forestry, Mosul University. It aims at studying the effect of adding different levels of *Saccharomyces cerevisiae* to the fodder and drinking water on the production characteristics and the number of intestine bacteria of the local quail. The levels 0, 1, 1.5, 2 and 2.5% of yeast added to the fodder and 0.5 g/liter of drinking water. In the research 432 one-day old quail chicks were used and distributed randomly into six treatments, each of which included 72 chicks (72 chicks/treatment) and six replicates (12 chicks/replicate). Statistical analysis results showed a significant increase in the average living weight, weight increase, average consumption of fodder and the coefficient of the feed conversion ratio for the fourth, fifth and sixth treatments (2, 2.5 yeast in the fodder and 0.5 g. liter of water) compared to the other treatments and the control treatment. There were no significant differences in the dressing percentage and mortalities for all the experimental treatments. From the other hand, it was observed that there was a significant decrease of the total number of bacteria in the birds fed with the fourth treatment compared to the other treatments and there was no significant difference when adding the yeast to the drinking water and the treatment involving 1% of yeast on the total number of the bacteria. There was also a significant decrease in the number of *E. coli* and *Salmonella* in the treatment that involve all the levels of *Saccharomyces cerevisiae* in the fodder. Also, a significant increase was observed in *Lactobacilli* bacteria for the treatments involving 1.5 and 2% of the *Saccharomyces cerevisiae* compared to those in other treatments.

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### INTRODUCTION

In the recent years, antibiotics were 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 eliminate the harmful and the useful bacteria and decreases the mucous layer that covers the cells walls covering the intestine and this in turn made them vulnerable to be infected with pathogenic microbes and results in and imbalance of the intestinal flora and weakening the immunological system (Green et al., 2001).

Researches 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, excluding them and then causing the positive microbial balance and they are called the Probiotics (Zinedine, et al., 2005).

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*Saccharomyces cerevisiae* are unicellular organisms that proliferate 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 helps the growth of *Lactobacilli* and *Bacillus Subtilis* bacteria, which increase the average growth and promote the efficiency of feed conversion ratio (Mohan, et al., 1995 and Jin et al., 2000). *Saccharomyces cerevisiae* plays 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 AND METHODS

The present study was conducted in a poultry farm, department of Animal Resources at the College of Agriculture and Forestry, Mosul University for the period 4/12/2013 – 16/1/2014. In the research, 432 of local quail chicks were used and distributed randomly into six treatments, each of which included 72 chicks (72 chicks/treatment) and six replicates (12 birds/replicate). *Saccharomyces cerevisiae* was added to the fodder with levels of 0, 1, 1.5, 2 and 2.5% of yeast was added to the fodder and 0.5 g/liter of drinking water. The birds were fed with a unified fodder that contains 24.8% of raw protein, 3012 assimilated energy/kg of fodder, 5.5% ether extract, 1.92% raw fibers, 1.25% lysine, methionine 0.85%, methionine + Cystine 0.89% and adding the compound that contains the vitamins and necessary minerals).

Feed Ingredient	Percentage (%)
Yellow corn	51
Soybean meal (44%)	40
Protein concentrate*	5
Vegetable oil	3
Common Salt	0.3
Limestone	0.7
Total	100%
Calculated and estimated chemical composition of the diets %	
Assimilated energy/kg	3012.80
Crude protein calculated	24.080
Crude protein estimator	23.77
Ether extract calculated	5.5
Ether extract estimator	5.39
raw fibers calculated	1.92
raw fibers estimator	1.81
Ash estimator	5.02
Methionine +Cystine	0.89
lysine	1.25

Moreover, fodder and water were provided to the birds freely and 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: weight of the living body (g), weekly increase in weight

(g), quantity of fodder consumed (g), feed conversion ratio coefficient, rate of mortalities, dressing percentage, estimation of the microbial content of the intestine by taking 1 ml of the intestine content and putting it in a tube containing 9 ml of sterilized water and then the tube is shaken. After that 1 ml is withdrawn from the first tube and casting it into the second tube, which also contains 9 ml and shaking it. Then, the process was repeated until reaching the required dilution, and then 0.1 ml is withdrawn from the last tube and put in the previously prepared Petri plate and spreading it on the agar surface and then the plate is sealed to prevent contamination. Then the plates were kept in incubators at 37 °C for 24 hours and the cells or colonies are calculated using the bare eyes and the number is multiplied by the inverse of dilution to determine the actual total number of the bacteria (Apha, 1984). The statistical analysis was conducted using the Complete Random Design (C.R.D.) and the averages were compared in accordance with Duncan's test for all the characteristics the study tackled. Table (1) shows the essential components of the fodder used in this study.

## RESULTS AND DISCUSSION

### First: The production characteristics

Table (2) shows a significant superiority ( $0.05 \geq A$ ) in the living weight for the birds fed with the fourth treatment (2% of living *Saccharomyces cerevisiae*) compared to all the treatments (240 g/bird). Also, there was a significant superiority in the living weight for the treatment involving 2.5% and 0.5 g/liter of drinking water living *Saccharomyces cerevisiae* for the period mentioned compared to the control treatment, which were (227.30, 229.20 and 210.2 g/bird) respectively for the sixth week. These results are in conformity with what was concluded by Omar and Taha (2013), AlShammari et al., (2012 and Abdul-AlWahab (2010) that there was a significant superiority in the living weight of the broiler when adding *S.cerevisiae* to the fodder compared to the control treatment. It is clear, from the results of table (2) that adding different levels of *S.cerevisiae* had a significant effect on the living body weight and there was no significant negative effect of adding *S.cerevisiae* in all the treatments. It is evident from table (2) that the highest total increase in weight was obtained when feeding the birds with the fodder containing 2% of dry *S.cerevisiae* that had the value of (214.03 g/bird) and was significantly superior over (0.05) over all the other treatments containing different levels of *S.cerevisiae* in addition to the control treatment. From the table, it is also noticed that adding more *S.cerevisiae* to the sixth fodder or adding it to the drinking water with the rate of 0.5 g/liter in the previous fodder led to a significant decrease in the average total weight compared to the fourth treatment although these two treatments were significantly superior compared to the control treatment as the three treatments had the values of (201.29, 197.24 and 184.24) respectively. The reason behind the increase in the weight of birds when fed with the fodders containing different levels of *S.cerevisiae* might be due to the role played by the cellular wall of *S.cerevisiae*, which constitute 30% of its dry weight and which is composed mainly of complex saccharides represented by B-glucan, Mannan and Chitin and these saccharides will eventually lead to an increase of the useful organisms reproduction and prevent the reproduction of the harmful ones and this acts in a similar mechanism to the Probiotic in addition to improving the immunological of the quails that reflects on the health of the birds and their living weights (Huff et al., 2010 and Falaki et al., 2011). These results are in conformity with the findings of Omar and Taha (2013) and Hosseini (2011), who observed a significant improvement when adding the probiotic which contains the *S.cerevisiae* to the broilers fodders with different levels. Table (2) indicates that the total consumption of fodder during the period was significantly high for the fourth and sixth treatments of (2% *Saccharomyces cerevisiae*) and (0.5g/liter in drinking water) with values of 690.67 and 699.73 g/bird, and there were no significant differences between the third and the fifth treatments in terms of the quantity of fodder consumed compared to the control treatment. The significant increase in total fodder consumption for the birds fed with the sixth fodder (0.5g/liter of drinking water) contradicts with the findings of AL-Bandar et al., (2005), as they observed that there was a decrease in fodder consumed by the broilers fed with liquid yeast and the increase of consuming the fodder containing 2% of *Saccharomyces cerevisiae* agree with what was mentioned by Shareef and Al-Dabbagh (2009) and Paryad and Mahmoudi (2008), who indicated that adding the probiotic (yeast) with a percentage of 2% to the fodder led to a significant increase

in the quantity of the fodder consumed in the sixth week. As for the feed conversion ratio coefficient for the total period, table (2) indicates that there is no significant differences between the control treatment (3.61) and the treatments containing 1%, 1.5% and 0.5% g/l of the dry baker yeast and (3.53, 3.40 and 3.44) respectively although a positive improvement was observed in this characteristic of the two treatments compared to the control treatment. The fourth fodder (2% dry *Saccharomyces cerevisiae*) showed the highest feed conversion ratio in the period of the study (3.22 g fodder/g weight increase), which did not differ significantly from those in the fifth treatment (2.5% yeast) and the sixth treatment (0.5 g of yeast/liter of drinking water) as their values were 3.41 and 3.44 respectively. Generally, it is observed from the table that all the fodders containing different levels of *S.cerevisiae* showed significant and arithmetic superiority compared to the control treatment. It is noticed from table (2) that there was no significant effect of adding different levels of *S.cerevisiae* to the fodders or the drinking water on the dressing percentage of the quails as the values were 74.07, 76.78, 75.79, 74.65, 73.76 and 74.30 %) respectively. These results are in conformity with the findings of Younis and AlSayigh (2008) who used the broiler type Cobb, that there were no significant differences between the treatment that involve additions of probiotic (2, 4 and 6 kg/ton of fodder) compared to the control treatment in terms of the dressing percentage at the age 42 days. From the other hand, no quail mortalities were observed in this experiment during the period of the study for all the treatments with different levels of *Saccharomyces cerevisiae* compared the control fodder, which is in conformity with what was found by Hatab et al (2010) as there were no significant difference when adding *Saccharomyces cerevisiae* to the fodder of male broilers type (Ross 368) with ages of 5 weeks with values of zero and 3 g/kg of fodder.

**Table (2) The effect of adding *Saccharomyces cerevisiae* to the fodder or drinking water on the production characteristics of the local quail at age of 6 weeks**

Treatment characteristics	Treatment 1 Control	Treatment 2 (1%) Dry yeast	Treatment 3 (1.5 %) Dry yeast	Treatment 4 (2 %) Dry yeast	Treatment 5 (2.5 %) Dry yeast	Treatment 6 (0.5 %) liquid yeast (0.5 g/liter)
Living body weight (g)	210.20 ± 0.70 E	215.73 ± 0.77 D	222.50 ± 1.93 C	240 ± 0.73 A	227.30 ± 3.36 B C	229.20 ± 0.51 B
Total weight increase (g)	184.26 ± 4.94 D	189.91 ± 2.56 C D	196.43 ± 1.81 B C	214.03 ± 2.09 A	201.29 ± 4.64 B	197.24 ± 4.00 B C
Total fodder consumption (g/bird)	663.09 ± 2.31 B	675.06 ± 3.02 B	668.28 ± 1.53 B	690.66 ± 4.68 A	669.59 ± 3.63 B	699.73 ± 4.62 A
feed conversion ratio (g of fodder/g weight increase)	3.61 ± 0.11 A	3.53 ± 0.03 A B	3.40 ± 0.03 A B C	3.22 ± 0.04 C	3.33 ± 0.08 B C	3.44 ± 0.07 A B C
Mortalities %	0	0	0	0	0	0
dressing%	74.07 ± 0.60 A	76.78 ± 0.98 A	75.79 ± 2.12 A	74.65 ± 1.19 A	73.76 ± 1.33 A	74.30 ± 1.84 A

Values that have different letters within one column indicate that there are significant differences at the probability level of (0.05 ≤ A)

### Second: umbers of organisms in the intestine

From table (3) it is observed that the number of organisms in the digestive duct decreased significantly (0.05) with the increase of the living yeast in the fodder and the low level of yeast in

both the fodder and in the drinking water (treatments two and six) had no significant effect on the total number of bacteria although the decrease in their number was arithmetically observed.

The acute decrease in the total number of bacteria was found in the fifth treatment that had the highest level of *Saccharomyces cerevisiae* (2.5%) in the fodder compared to all the other treatments and this is in conformity with what Nava et al (2005) mentioned, as they recorded the decreasing effect of *S.cerevisiae* against the organisms in the digestive duct. From the other hand it was clear that the numbers of *E.coli* also decreased significantly in Jejunum when adding high levels (2 and 2.5%) of *S.cerevisiae* to the fodder for the fourth and fifth treatments as the values were 3 and 3.6  $Lo^{10}$  CFU/mg. No significant effect was shown when *S.cerevisiae* was added to the drinking water for the number of *E.coli*. Moreover, table (3) shows that adding *S.cerevisiae* to the fodder or drinking water has significantly decreased the number of *Salmonella* compared to the control treatment. The lowest number of *Salmonella* was in the fodders containing 1.5 and 2.5% of *S.cerevisiae* and these results are in conformity with the results reached by Park et al., (2002), who demonstrated that the numbers of the bacteria *Perfringer*, *Clostridium* and *E.coli* were low after adding *S.cerevisiae* to the fodder of the broilers. Also, these results are in conformity with the findings of Hassanein and Soliman (2010) and Zangana and Naji (2007), who found that there was a decrease in the number of *E.coli* in ileal, crop, jejunum and cecum when adding the probiotic that contains *S.cerevisiae* to the laying hens fodder. Abdul-AlWahab (2010) confirmed that adding *S.cerevisiae* to the fodder of the broilers with percentages of 1% and 2% led to a decrease in the number of *Salmonella* isolated cecum in the age of 38 days.

**Table (3) The effect of live baker yeast (*Saccharomyces cerevisiae*) to the fodder or drinking water on the total number of bacteria (*E.coli*, *Salmonella* and *lactobacilli*  $Lo^{10}$ CFU) in local quail**

Bacteria Treatments	Number of cell bacteria	No. of <i>E.coli</i>	No. of <i>Salmonella</i>	No. of <i>Lactobacilli</i>
Treatment 1 Control	27.3±2.30 A	7.5±1.73 A	19.4±1.15 A	7.2±1.72 C
Treatment 2 (1%) Dry <i>Saccharomyces cerevisiae</i>	25.2±1.15 A	4.1±3.46 B	5.0±0.57 B C	6.8±1.15 C
Treatment 3 (1.5 %) Dry <i>Saccharomyces cerevisiae</i>	14.7±1.15 B	5.2±1.15 A B	2.1±0.57 C	21.3±1.72 A
Treatment 4 (2 %) Dry <i>Saccharomyces cerevisiae</i>	12.6±1.15 B	3.0±1.15 C	7.3±1.15 B	18.3±0.57 A
Treatment 5 (2.5 %) Dry <i>Saccharomyces cerevisiae</i>	8.9±1.15 C	3.6 ±1.73 C	3.8±1.15 C	12.8±2.40 B
Treatment 6 (0.5 %) liquid <i>Saccharomyces cerevisiae</i> (0.5 g/liter)	18.4±1.15 A B	6.2±1.73 A	8.5±1.15 B	8.4±1.15 C

Values that have different letters within one column indicate that there are significant differences at the probability level of ( $0.05 \leq A$ )

Table (3) indicates the the number of *Lactobacilli* increased significantly when adding *S.cerevisiae* to the fodder with levels 1.5% and 2% (the third and fourth fodders), followed by the fodder containing 2.5% *S.cerevisiae* as it had the values of 21.3, 18.3 and 12.8  $Lo^{10}$ CFU respectively. From the other hand, no significant effect was observed when adding *S.cerevisiae* with a level of 1% to the fodder or to 0.5 g/l of drinking water, which were both not significantly different with the control fodder. This result is in conformity with the results of Kim et al., (2002) when they added *Pichia Farinose* to the laying hen fodders and also with the findings of Kabir



(2009) who added *S.cerevisiae* to the broiler foders as they reported an increase in the number of Lactobacilli bacteria in the Jejunum due to this addition. Fuller mentioned that Lactobacilli secretes Lactic acid, which decreases the pH value in the digestive tract, and this in turn has a direct effect on increasing the number of Lactobacilli in the intestine. This increase of the number of Lactobacilli will decline the growth of some harmful bacteria like the Salmonella and E.coli, as confirmed by Murry et al., (2006).

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دراسة تأثير إضافة مستويات مختلفة من خميرة ( *Saccharomyces cerevisiae* ) في العلف أو ماء الشرب في الأداء الإنتاجي والميكروبات المعوية لطائر السمان المحلي

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**الخلاصة**

اجريت هذه الدراسة في حقل دواجن قسم الثروة الحيوانية – كلية الزراعة والغابات – جامعة الموصل هدفت الى دراسة تأثير مستويات مختلفة من الخميرة الجافة *Saccharomyces cerevisiae* في العلف او في ماء الشرب في الصفات الإنتاجية واعداد بكتريا الامعاء لطائر السمان استخدمت المستويات صفر، 1، 1.5، 2، 2.5% خميرة بالعلف و0.5غم/لتر في ماء الشرب استخدم 432 فرخا من طائر السمان بعمر يوم واحد. وزعت عشوائيا الى 6 معاملات وبواقع 72 طائر /معاملة وبسته مكررات (12 طائر/مكرر). اظهرت نتائج التحليل الاحصائي حصول زيادة معنوية في معدل وزن الجسم الحي والزيادة الوزنية ومعدل استهلاك العلف الكلي ومعامل التحويل الغذائي للمعاملات الرابعة والخامسة والسادسة (2، 2.5% خميرة بالعلف و0.5غم /لتر ماء) مقارنة بالمعاملات الاخرى والسيطرة. ولم يكن هناك فروقات معنوية في نسبة التصافي والهلاكات لكافة المعاملات التجريبية. في حين لوحظ حصول انخفاض معنوي لعدد البكتريا الكلي في الطيور المغذاه بالمعاملة الرابعة مقارنة بالمعاملات الاخرى، ولا يوجد تأثير معنوي لا ضافة الخميرة في ماء الشرب والمعاملة الحاوية على 1% خميرة في عدد البكتريا الكلية وكذلك حصول انخفاض معنوي في لعدد بكتريا القولون *E.coli* و *Salmonella* في المعاملات الحاوية جميع مستويات الخميرة الحية في العلف . كما لوحظ زيادة معنوية في اعداد بكتريا العصيات اللبنية *Lactobacilli* للمعاملات الحاوية على 1.5 و2% خميرة حية مقارنة بتلك في المعاملات الاخرى .

**الكلمات المفتاحية:**

السمان *Saccharomyces cerevisiae* ، خميرة الخبز