

RESEARCH PAPER

Effect of Commercial Baker's Yeast Supplementation (*Saccharomyces Cerevisiae*) in Diet and Drinking Water on Productive Performance, Carcass Traits, Haematology and Microbiological characteristics of Local Quails

Rebin A. Mirza¹, Sheren Dh. Muhammad¹ and Karwan Y. Kareem¹

¹ Department of Animal Resource, College of Agricultural Engineering Sciences, Salahaddin University-Erbil, Kurdistan Region, Iraq

ABSTRACT:

The research was conducted to assess the impact of supplementation of *Saccharomyces cerevisiae* (SC) on the quality of products, intestinal microbiota, haematology parameters and histology of local quail. A number of 99 days old quails were randomly assigned and divided into three treatments in triplicate which contained 33 birds in each treatment for 42 days experimental period. Design of the dietary treatments was formulated as followings; control (T1) basal diet, 1% of SC in basal diet (T2) and 1% of SC in drinking water (T3). The results of this study revealed that addition and supplementation of SC had positive impact on blood biochemical profile and products quality of local quails. The contents of beneficial bacteria (*Lactobacillus* spp.) in caecal digesta was increased in both treatment of adding SC in diet and drinking water, while the coliform bacteria significantly ($p < 0.05$) decreased in comparison to the control group. Also, Supplementation of SC in diet and drinking water substantially increased number of lymphocyte and lowered H/L (Heterophil/Lymphocyte) ratio comparing to control treatment at the final stage of the study. No significant ($p > 0.05$) differences was seen regarding carcass traits of the treated quails. To summarize, baker's yeast supplementation in the diet and drinking water of quails substantially improved production performance, gut microbiota and hematology parameters of local quails.

KEY WORDS: Quail, Yeast, Performance, Gut microbiota, Haematology

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1.INTRODUCTION :

Japanese quails (*Coturnix coturnix japonica*) have been of great interest among academics and poultry breeders recently since it is small in size, comforting to handle, a high number can be breed in a limited area and possesses high ability in egg production.

Yeast and yeast product derivatives have being fed to farm animals for more than ten decades (Owens and McCracken, 2007). Baker's yeast "*Saccharomyces cerevisiae*" is one of the popular widely commercialized types of yeast (Rezaeipour *et al.*, 2012). Yeasts are most widely used natural growth promoters (Mohamed *et al.*, 2015) because of its natural digestibility improving traits; nutrients absorption ability and enteric pathogens infection control (Gao *et al.*, 2005). Yeasts are probiotics act by competitive exclusion, controlling gut pH, beneficially alter the inherent gut microbiota, lysozyme and peroxides, inhibit

* Corresponding Author:

Rebin A. Mirza

E-mail: rebin.mirza@su.edu.krd

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the effects of toxins and improve the immune system (Grashorn, 2010).

The composition of yeast cell wall sugar consist of 30-60% polysaccharides (15-30% of β -1,3/1,6-glucan and 15-30% of mannan sugar polymers), 15-30% proteins, 5-20% lipids. The Beta-1, 3/1, 6-glucans that present in yeast cell wall was commonly known for a its immune modulator substance in poultry and humans (Noppawat *et al.*, 2017).

The objective of the research was to examine the influence of commercial baker's Yeast (*Sachharomyces Cerevisiae*) supplementation in diet and drinking water on productive performance, haematology and microbiological traits of local quails.

2. MATERIALS AND METHODS

2.1. Experimental design

This research was carried out in Salahaddin University, College of Agriculture, Kurdistan Region, Erbil. This experiment is designed to investigate the influence of supplementation Baker's yeast (*Saccharomyces Cerevisiae*) in drinking water and diet on productive performance, carcass traits, microbiological and haematology parameters of Japanese quails. Ninety nine quails at 1 week of age were randomly registered into three treatments in triplicates containing 11 quail each, as CON= Control no baker's yeast in feed and water, Diet= adding 1% baker's yeast in commercial broiler diet, and Water= adding 1% baker's yeast in drinking water, for 42 days. The quails were scaled and kept in floor pens (60 × 60 cm), on wood shavings. The quails also designed in away to have full access to drinking water and feed.

2.2 Growth performance

During the whole study period the basic productive performance indicators includes body weight, weight gain, feed intake and conversion ratio, and European production efficacy factor was measured. Also, dressing percentage, weight of breast and leg were measured.

2.3 Haematology parameters

At the final stage of the experiment three quails from each treatment were randomly selected and killed by cervical dislocation. The blood samples were kept in fully sterilized tubes with presence anticoagulant Di-Potassium ethylene diamine tetra acetic acid (K_2EDTA). All parameters related to blood (Hemoglobin, WBC, Lymphocyte, Heterophil and H/L ratio) were examined by Full-Auto Haematology Analyzer (MCL 3800, China). (Pelicano *et al.*, 2005; Baurhoo *et al.*, 2007).

2.4 Gut microbiota analysis

At the end of experimentally designed period, the quails were taken from treatments and their caecal digesta were fully aseptically separated to investigate the intestinal microorganisms (*Lactobacillus* spp. and total coliform bacteria). Subsequently, these suspensions were serially diluted from 10^{-1} to 10^{-9} . For each dilution, 0.1 ml from the dilution was plated onto sterile selective medium agar to count targeted bacteria groups as following; MacConkey agar (Sigma-Aldrich, UK) for total coliform and MRS (De Man, Rogosa and Sharpe) agar for *Lactobacillus* spp.. The colonies number of microbial was then counted to determine the colony forming units (CFU). CFU/gm for fresh caecal digesta were calculated and expressed as logarithms.

2.5 Statistical Analysis

The data obtained in the experiments were statistically analyzed using one-way ANOVA test, SPSS program (Statistical Package for Social Science) (SPSS 22, 2005). Descriptive statistics aided for the analysis of the data. Therefore, means and stander error were calculated. Duncan test utilized and aided to calculate significant differences at 0.05 levels among the various parameters (Duncan, 1995).

3. RESULTS

Growth performance data is presented in Table 1. There were no significant ($p>0.05$) differences observed among treatments in relation to total feed intake. While, Final

weight, FCR and EPEF were improved significantly ($p < 0.05$) when SC added in water and diet compared to control group. Carcass traits are shown in Table 2. There was no significant ($p > 0.05$) difference observed among treatments on carcass traits.

Table 3 shows the influence of SC supplementation in diet and drinking water on the composition of microflora in the caecum digesta at 42 days of age. Both administrations of SC supplementation noticeably ($p < 0.01$) increased number of *Lactobacillus* spp. and lowered number of coliform bacteria in comparison to control group.

Table 4 shows the impact of commercial baker's yeast supplementation in diet and drinking water on haematological parameters at six weeks of age. Both administration of SC supplementation were significantly ($p < 0.05$) increased the number of Lymphocyte and lowered the number of heterophil in comparison with control group. Also, the H/L ratio parameter was improved by both administration of SC supplementation compared to control group. While, no significant ($p > 0.05$) differences was observed among treatments on haemoglobin and WBCs traits.

4. DISCUSSION

The current research might confirm the positive impact of yeast supplementation *Saccharomyces cerevisiae* (SC) as novel probiotic in feeding diet and drinking water on growth rate, intestinal microflora and haematology.

This positive influence could directly be attributed to improvements in performance of birds. To the researchers' best knowledge, dissimilar microbial species of probiotics have been utilized in poultry production (Mountzouris *et al.*, 2010; Patterson and Burkholder, 2003). Regarding broiler nutrition, probiotic species *Streptococcus*, *Bacillus*, *Aspergillus*, *Lactobacillus*, *Enterococcus*, *Bifidobacterium*, *Saccharomyces* and *Candida* have shown positive impact on broiler performance (Zulkifli

et al., 2000; Kalavathy *et al.*, 2003; Kabir *et al.*, 2004; Gil De Los Santos *et al.*, 2005). This might be attributed to modulation of intestinal microflora and pathogen inhibition (Pascual *et al.*, 1999).

In the current study, the data showed in table 1, indicates that supplementation of SC significantly enhanced better body weight gain when SC added to diet only, feed conversion ratio and EPEF (European production efficacy factor). This positive enhancements in feed conversion efficiency has also been reported by previous researchers (Zeweil, 1997; Chumpawadee *et al.*, 2009; Devarestti, 2016).

Supplementation of SC in both diet and drinking water has also led to higher lactobacilli and the lower coliform bacteria comparing to control. This might be related to increasing the production of short chain fatty acids and lowering pH value in the intestine since it possesses bacteriostatic and bactericidal properties (Fuller, 2001).

It has also been reported that SC can stimulate the immune system of the bird against pathogenic bacteria, especially *Salmonella*, *E. coli* and *Clostridium* (Ghadban, 2002) and reduces bird mortality chances (Kralik *et al.*, 2004).

It has been studied that presence of stress could lead to stimulate the adrenal gland to excrete stress hormones which possess influential impact to analyze a lymphatic cell and then lead to a rise in H/L ratio (Gross and Siegel, 1983). Therefore, ratio of H/L can be taken as a sign for the wellbeing of animals and any rise in H/L automatically refers to presence of high stress (James and Stanley, 1989). In the current research, the H/L ratio at the end of experiment was decreased for both yeast supplementation in comparison with the control group. Low H/L ratio in the treatments might be associated with the yeast supplementation in both diet and drinking water which could diminish the nutritional stress or any stress which causes an increase in H/L ratio (Karoglu and Drudage, 2005).

Table 1: Effect of Commercial Baker's Yeast Supplementation in Diet and Drinking Water on growth performance of local quails at six weeks of age (Mean \pm SE).

Growth performance	Treatment			P. value
	CON	Diet	Water	
Initial weight (g)	24.10 \pm 0.42 a	24.26 \pm 0.34 a	24.85 \pm 0.13 a	0.992
Final weight (g)	213.13 \pm 3.84 b	236.33 \pm 6.38 a	222.76 \pm 3.71 ab	0.026
Weight gain (g/bird)	189.03 \pm 0.54 b	211.97 \pm 4.19 a	197.91 \pm 1.67 b	0.002
Feed intake (g/bird)	498.62 \pm 12.71 a	500.10 \pm 8.04 a	467.56 \pm 5.84 a	0.083
Feed conversion ratio	2.63 \pm 0.06 a	2.36 \pm 0.08 b	2.36 \pm 0.02 b	0.034
(EPEF) ¹	129.25 \pm 5.24 b	129.88 \pm 1.24 a	121.83 \pm 0.83 a	0.213

^{ab} Data in the same row with different superscript are significantly different (P<0.05).

¹ EPEF = liveability (%) \times live weight (kg) \times 100/ age (d) \times FCR.

Table 2: Effect of Commercial Baker's Yeast Supplementation in Diet and Drinking Water on dressing parameters of local quails at six weeks of age (Mean \pm SD).

Parameters	Treatment			P. value
	CON	Diet	Water	
Dressing Percentage	72.74 \pm 0.37 a	73.45 \pm 0.60 a	73.08 \pm 0.25 a	0.55
Leg (%)	27.0 \pm 2.0 a	30.32 \pm 2.42 a	28.46 \pm 1.26 a	0.524
Brest (%)	46.04 \pm 1.72 a	49.05 \pm 1.82 a	48.96 \pm 1.34 a	0.398

^{ab} Data in the same row with different superscript are significantly different (P<0.05).

Table 3: Effect of Commercial Baker's Yeast Supplementation in Diet and Drinking Water on caecal microbiota of local quails at six weeks of age (Mean \pm SD).

Microbes	Treatment			P. value
	CON	Diet	Water	
<i>Lactobacillus</i> ssp.	8.72 \pm 0.15 b	9.43 \pm 0.16 a	9.30 \pm 0.13 a	0.033
Total Coliform	7.19 \pm 0.03 b	6.89 \pm 0.04 a	6.94 \pm 0.05 a	0.007

^{ab} Data in the same row with different superscript are significantly different (P<0.05).

Table 4: Effect of Commercial Baker's Yeast Supplementation in Diet and Drinking Water on Haematological parameters of local quails at six weeks of age (Mean \pm SE).

Parameters	Treatment			P. value
	CON	Diet	Water	
Haemoglobin (g/L)	135.80 \pm 13.29 a	170.06 \pm 9.91 a	150.46 \pm 2.02 a	0.115
WBC (No. \times 10 ⁹ /L)	3.76 \pm 0.84 a	6.5 \pm 1.21 a	5.7 \pm 0.72 a	0.183
Lymphocyte (%)	69.56 \pm 1.53 b	79.23 \pm 1.59 a	76.86 \pm 1.83 a	0.015
Heterophil (%)	23.33 \pm 0.88 c	13.66 \pm 0.17 a	16.66 \pm 0.66 b	<0.001
H/L ratio (%)	0.33 \pm 0.01 c	0.16 \pm 0.003 a	0.21 \pm 0.008 b	<0.001

^{ab}Data in the same row with different superscript are significantly different (P<0.05).

5. CONCLUSIONS

Yeast supplementation could possess positive influence the gut microbiota and hence improve health and performance of quails. The current study confirms that the supplementation of baker's yeast (*Saccharomyces cerevisiae*) as a probiotic in diet and drinking water significantly improved the growth ratio and performance, gut microbiota and blood haematology parameters of local quails.

Conflict of Interest (1)

None

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