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THE EFFECTS OF KEFIR RICH IN PROBIOTIC ADMINISTRATION ON SERUM ENZYMES AND PERFORMANCE IN MALE JAPANESE QUAILS

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ABSTRACT

The present study was conducted to investigate the influence of different levels of Kefir as probiotic origin on performance values and serum enzymes of male Japanese Quails. Total of 180 one-day old male Japanese quail chicks were randomly assigned in 5 treatments and 3 replicates. Group 1 served as control and received normal drinking water. Chicks in group 2, 3, 4 and 5 were applied 3, 6, 9 and 12 percent Kefir in drinking water respectively until the end of the experiment (42 days). Consumption of different levels of Kefir showed a decrease on liver weight ($P<0.05$). Treatment group received 12% Kefir significantly increased heart weight compared to other groups ($P<0.05$). Treatment groups received 3, 9 and 12 percent Kefir decreased feed intake ($P<0.05$). Quails received different levels of Kefir increased AST enzyme activity ($P<0.05$). Using 3% and 6% Kefir caused a decrease in ALP enzyme activity ($P<0.05$). Results indicated that using lower levels of Kefir revealed more positive effects than higher levels.

Key words: Kefir, Antioxidant, MDA, Performance, Enzyme, Japanese quail.

INTRODUCTION

Kefir is the fermentation product of milk with Kefir grains and other cultures prepared from grains. The composition of kefir depends greatly on the type of milk that was fermented (Kneifel and Mayer 1991; Zubillaga *et al*., 2001; Cais-Sokolinska *et al*., 2008). However, during the fermentation, changes in composition of nutrients and other ingredients have also been shown to occur (Bottazzi *et al.,* 1994). Kefir grains contain a complex mixture of bacteria (including various species of lactobacilli, lactococci, leuconostocs and acetobacteria) and yeasts (both lactose-fermenting and non-lactose-fermenting) such that it contains beneficial yeast as well as probiotic bacteria found in yogurt (Otles and Cagindi, 2003). The components of Kefir such as various strains of lactobacillus and yeasts can act as a probiotic in poultry nutrition (Fuller, 1989). Lactobacillus kefir is a lactic acid bacterium isolated from Kefir grains or Kefir milk (Garrote et al., 2001). There are data to show that many lactobacilli are capable of producing a wide range of antimicrobial compounds, including organic acids (lactic and acetic acids), carbon dioxide, hydrogen peroxide, ethanol, diacetyl and peptides (bacteriocins) that may be beneficial not only in the reduction of food borne pathogens and spoilage bacteria during food production and storage, but also in the treatment and prevention of gastrointestinal disorders and vaginal infections (Tahara and Kanatani 1997; Zamfir *et al*., 1999; Bonade´ *et al.,* 2001; Messens and De Vuyst 2002; Jamuna and Jeevaratnam 2004). Yeast also acts as a probiotic in animal feed (Saegusa *et al.*, 2004). There are two probabilistic explanations for yeast action. The first, action of yeast is most probably supporting the growth of lactic acid bacteria and the second, a competitive exclusion of pathogenic bacteria by yeast and its products (Onifade, 1998). Simova (2002) and Yϋksedag *et al*. (2004) found that lactose fermenting yeast were Kluyveromyces lactis and Kluyveromyces marxianus, Torula kefir, while non-lactose-fermenting yeast was Saccharomyces cerevisiae. Yeast is an excellent source of selenium and chromium; two trace minerals which may have positive effects on broiler health (Celik *et al*., 2001). Yeast acts as an antioxidant and also stimulates the immunity system of the bird against some pathogenic bacteria (Ghadban, 2002), reduces bird mortality chances (Kralik *et al.,* 2004) and with addition in broiler diets improves quality of broiler meat (Zhang *et al.*, 2005; Nikpiran *et al.,* 2013). Therefore, feeding yeast (Saccharomyces cerevisiae) to broiler chicks and Japanese quails improves body weight gain, feed conversion ratio (FCR) and survival rate (Paryad and Mahmoudi, 2008; Nikpiran *et al.*, 2013). Thus, Kefir can be defined as a probiotic food ingredient and feed additive (Otles and Cagindi, 2003). Administration of probiotic either through the feed or via the drinking water was tested by Mastbaum *et al*. (1997) in broilers. They found that administration of probiotic via drinking water significantly affected live weight gain and feed conversion efficiency at the end of the 41st day. They also emphasized that this beneficial effect was clearer at the end of the 31st day.

There are many studies focus on Kefir effects on human health, but less attention has been given to their effects on poultry production. The aim of present study was to investigate the effects of different levels of Kefir on performance values, internal organs weight and serum enzymes activity in Japanese quails.

MATERIALS AND METHODS

Experimental design and housing: Present study was conducted at Islamic Azad University, Shabestar Branch-Iran in winter of 2013. A total of 180 one-day old male Japanese quail chicks mean body weight 7.78±0.39 gram that were provided from the Damavand quail Co. flock and randomly assigned in 5 treatment groups with 3 replicates and 12 chicks (36 birds/group). The quails in wiry cages (0.3× 0.5×0.35 m) were established with a distance from one place to another at one room with controlled standard temperature, humidity, ventilation and lighting for quails housing. Temperature was maintained at 35$^{\circ C}$ for the first 5 days and then gradually reduced according to normal management practices until a temperature of 22$^{\circ C}$ was achieved. Continuous lighting was maintained in all experimental period (2.5 watt/m^2) and kept for 42 days.

Kefir preparation: Kefir grains were provided from the Islamic Azad University, Faculty of Veterinary Medicine, Department of Food Hygiene and Technology. Raw milk was obtained from a special milk production farm daily (Pegah, Iran), and heated to 90$^{\circ C}$ for minimum 10 min, then cooled to inoculation temperature (25$^{\circ C}$). The 5% active Kefir grains were mixed to milk and finally incubating at 22$^{\circ C}$ for 20 hours as needed (Marshall and Cole, 1985).

Treatments and additives: The experimental design was Completely Randomized Design (CRD), with five treatments and three replicates for each treatment. Nutrients compositions of diets for quails at 1 to 42 days old were based on the National Research Council (NRC, 1994) recommendations (Table 1). All treatment groups received basal diet and Kefir beverage was added to drinking distilled water at a concentration of 0.0% (Control group), 3% (Group 2), 6% (Group 3), 9% (Group 4) and 12% (Group 5). Both balanced diets and water were offered *ad libitum* for all treatments at 1 to 42 days old.

Blood sampling and measurements: Feed intake (FI) of each experimental cage was recorded daily. At the end of experimental period (42 d) the total body weight (BW) and dressing factor of birds in each cage was measured and then feed conversation ratio (FCR) was calculated. Before slaughtering the final BW of sample bird and after that weight of selected organs including liver, heart, Proventriculus, Gizzard and Testes were recorded individually and presented as a percentage of live body weight. At 42 day of age in fasting state, blood samples without anti coagulant were collected by cervical cutting of two birds per pen (N=6) and rapidly were centrifuged at 5000 rpm during 5 min and then sera by using commercial kits (Pars Azmun, Iran) for Aspartate aminotransferase (AST), Alkaline phosphatase (ALP), Alanine transaminase (ALT) and *Lactate* dehydrogenase (LDH) in auto analyzer (ALCYON 300) were assayed by international federation of clinical chemistry methods (IFCC, 2011).

Table 1. Ingredient and calculated analysis of basal diet

Ingredients	*Ration (%)*
Yellow Corn	*53.00*
Soybean Meal, 44%CP	*37.00*
Fish Meal, 60%CP	*5.50*
Vegetable Oil	*1.00*
Oyster Shell	*1.00*
Mono Calcium Phosphate	*1.50*
DL-Methionine	*0.15*
Sodium Chloride	*0.15*
*Mineral-Vitamin Premix**	*0.50*
Vitamin A	*0.10*
Vitamin E	*0.10*
Analysis results	
ME (Kcal/Kg)	*2863.00*
CP (%)	*24.40*
Calcium (%)	*1.02*
Available Phosphorus (%)	*0.59*
Methionine (%)	*0.57*
Methionine +cyctine	*0.93*
Lysine (%)	*1.54*

*Supplemented for kg of the diets: Vit. A, 12000 IU; D3, 2000 IU; E, 20 mg;
K3, 3 mg; B2, 7 mg; B3, 12 mg; B5, 3 mg; B12, 0.03 mg; Biotin, 0.1 mg;
Choline chloride, 300 mg; Mn, 130 mg; Fe, 70 mg; Zn, 60 mg; Cu,12 mg;
I,1 mg; Se, 0.2 mg, and adequate antioxidant.

Statistical analysis: The data collected were subjected to analysis of variance (ANOVA) using the General Linear Model (GLM) procedure of SAS (2001) and means were compared by Duncan`s Multiple Range test at P<0.05 level (Duncan, 1955).

RESULS AND DISCUSSION

Performance values and mortality: In present study, FI in birds received 3% Kefir (729.77 g/bird), 9% (718.89 g/bird) and 12% (734.32 g/bird) was lower (P<0.05) than birds of control group (742.32 g/bird) and birds received

6% Kefir (743.49 g/bird). On the other hand, present study indicates that quails consumed 3%, 9% and 12% Kefir couldn`t improve feed intake compared to birds received 6% Kefir and control group. FCR, BW and dressing percentage were intermediate state for all treatment groups (Table 2). BW as an important indicator of production (Singh and Nordskog, 1982) was lower in all treatment birds than control group, but there were no significant changes. In contrast to present study demonstrated a parallel Enhancement of live weight caused by increasing rates of Kefir probiotic (Cenesiz *et al*., 2008). Some studies reported that probiotic supplementation was not effective on growth performance in the poultry (Yeo and kim, 1997; cavazzoni *et al*., 1998; Yaman *et al*., 2006). The results are in contrast to the study of Yaman *et al.*, (2006) reported Kefir added into drinking water of poultry seemed to improve the performance by increasing body weight and daily weight gain and by decreasing daily feed intake and FCR. Although, the differences between supplemented groups and the control group were not statistically significant but 2.5% Kefir showed the highest BW and FI and 7.5% Kefir determined the lowest total FI and FCR values. Many investigations have been conducted to determine the effect of Lactobacilli cultures on the performance and intestinal microflora of domesticated animals since single or a mixture of Lactobacilli cultures have been found to improve broiler growth. Beneficial effects of Lactobacilli cultures on the growth of chicken were reported by several workers (Nahashon *et al.,* 1994a, b; Jin *et al.,* 1996). In a study demonstrated supplementation of lactobacillus bulgaricus into both feed and drinking water of quails and caused a positive response on live weight, feed intake and FCR (Arsalan and Saatci, 2004). Cho *et al.,* (2013) reported that inclusion of 0.1% β-glucan and 0.1% Kefir, either individually or combined, would improve growth performance and benefit meat quality in broiler chickens. A higher body weight revealed during 4 weeks of treatment with Kefir probiotic compared to birds fed basal diet. The Effects of Kefir probiotic on BW, FCR and FI in present study was in agreement with the study of Maiolino *et al.* (1992) which reported that probiotics did not any significantly positive effect on broilers. A critical appraisal of some studies conducted in the 1970's and early 1980 are on the effectiveness of probiotics in broilers and layers. Barrow (1992) indicated that there was little evidence in the studies to support the claims of positive effects made by probiotics and the studies may have suffered from errors in methodology and interpretation.

Table 2. Means growth performance values and mortality of quails fed different levels of Kefir at 42 days of age

Diets (treatments)	Feed Intake (g/bird)	Body Weight (g)	Feed Conversion Ratio (g/g)	Dressing (%)	Mortality (%)
Group 1 (control)	742.32[a]	240.40	3.09	72.01	4.45
Group 2 (3% Kefir)	729.77[b]	233.52	3.13	71.98	2.23
Group 3 (6% Kefir)	743.49[a]	239.54	3.11	73.01	4.45
Group 4 (9% Kefir)	718.89[c]	237.22	3.03	72.00	0.00
Group 5 (12% Kefir)	734.32[b]	237.79	3.09	73.08	2.23

Means (n=8) within each column with no common superscript differ significantly (P<0.05).

Internal organs weight: The birds received 3% (2.12), 6% (2.13), 9% (1.93) and 12% (2.08) showed a significant decrease (P<0.05) in liver weight compared to control group (2.24) (P<0.05). Several studies reported that the use of probiotics did not result in an increase in liver weight (Jin *et al.,* 1998; Ozcan E., 2003). Similarly, Mohan-Kumar and Christopher (1988) reported a significant decrease in liver weight due to lactobacillus and other beneficial microorganisms, which are present in probiotics, can prevent pathogens from colonizing the gastrointestinal tract via competitive exclusion. With decrease in harmful micro flora of intestine, less toxic by-products will be produced, so that the liver would be under a less pressure for detoxifying these byproducts (Mohan-Kumar and Christopher, 1988). Cenesiz *et al*. (2008) reported that no changes have been observed in liver weight in response to the various doses of Kefir treatment. The heart weight in birds received 12% Kefir (1.03) was significantly higher than birds received 3, 6, 9 percent kefir (P<0.05) and control group (P<0.05). Increasing heart weight in birds consumed 12% Kefir probably could be cause to heart hypertension or appearing to ascites syndrome (Vahdatpour *et al.,* 2011). The gizzard, testis and proventriculus weights in all treatments were intermediate state (Table 3). In a study demonstrated that the relative weight of breast meat and gizzard was higher in broiler chickens which received 0.1% β-glucan and 0.1% Kefir than birds received basal diet (Cho *et al*., 2013).

Table 3. Means Heart, Liver, Gizzard, Testis and Proventriculus weights (Percentage of live body weight) fed different levels of Kefir at 42 days of age

Visceral organ (%)	Group 1 (Control)	Group 2 (3% Kefir)	Group 3(6% Kefir)	Group 4(9% Kefir)	Group 5 (12% Kefir)
Heart	0.92[b]	0.93[b]	1.03[a]	0.90[b]	0 .89[b]
Liver	2.24[a]	2.12[b]	2.13[b]	1.93[c]	2.08[b]
Proventriculus	0.36	0.37	0.39	0.39	0.36
Gizzard	2.13	2.25	2.21	2.36	2.00
Testis	1.95	1.87	1.76	1.91	2.02

Means (n=8) within each rows with no common superscript differ significantly (P<0.05).

Serum enzymes: Serum AST, ALT, ALP, LDH activities (liver enzymes) were used to evaluated liver function, the increase in their activities are related to degenerations of hepatocytes or liver damage irrespective of its origin (Fatemi *et al.*, 2006 and Quezada *et al.*, 2002). Hassan *et al.* (2008) have reported that blood biochemical and hematological characteristics could be very important as indicator traits in breeding for the highest productive performance of birds. In present study all treatment groups significantly elevated AST enzyme level compared to control group (p<0.05). ALT enzyme activity in all treatment groups was higher than control group but the changes weren`t significance. The quails received 3% (876 IU/L) and 6% (821 IU/L) Kefir significantly decreased ALP enzyme activity compared to quails received 9% (1086 IU/L), 12% (1150 IU/L) Kefir and control group (1013 IU/L) (p<0.05). LDH enzyme activity didn't show significant changes. AST, ALT and LDH usually appear in serum when there is damage on the liver and muscle tissues caused by excessive stress (Scholl *et al.,* 2006 and Ozyurt *et al.,* 2006). An investigation on Kefir probiotic indicated that different doses of Kefir couldn`t cause differences between the experimental and control groups in terms of AST and ALT activity (Cenesiz *et al*., 2008).

Table 4. Means blood enzymes of quails fed different levels of Kefir at 42 days of age

Enzyme	Group 1 (Control)	Group 2 (3% Kefir)	Group 3 (6% Kefir)	Group 4 (9% Kefir)	Group 5 (12% Kefir)
AST (IU/L)	323[d]	345[c]	354[c]	373[b]	408[a]
ALT (IU/L)	15	16	16	19	19
ALP (IU/L)	1013[a]	876[b]	821[b]	1086[a]	1150[a]
LDH (IU/L)	638	630	640	635	644

AST: Aspartate aminotransferase, ALP: Alkaline phosphatase, ALT: Alanine transaminase and LDH: *Lactate* dehydrogenase Means (n=8) within each rows with no common superscript differ significantly (P<0.05).

Conclusion: Results indicated that using lower levels of Kefir had more positive effects than higher levels of Kefir. Consumption of Kefir were not significantly effective on most performance values and growth of Japanese quail. Receiving low doses of Kefir decreased ALP enzyme activity, liver weight and reducing effects of stress in Japanese quails. Thereby it can be a protective agent for liver against damage factors in quail's life.

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REFERENCES

Arsalan, C. and M. Saatci (2004). Effects of probiotic administration either as feed additive or by drinking water on performance and blood parameters in Japanese quails. Arch. Geflugelk, 68: 160-163.

Babazadeh, D., T. Vahdatpour, H. Nikpiran, M. Jafargholipour and S. Vahdatpour (2011). Effects of probiotic, prebiotic and synbiotic intake on blood enzymes and performance of Japanese quails (Coturnix japonica). Indian J. Anim. Sci., 81: 870–874.

Bonade, A., F. Murelli, M. Vescovo, and G. Scolari (2001). Partial characterization of a bacteriocin produced by Lactobacillus helveticus. Letters in Applied Microbiology 33: 153-158.

Bottazzi, V., C. Zacconi, P. G. Sarra, P. Dallavalle, and M.G. Parisi (1994). Kefir microbiologia, chimica, e tecnologia. L'industria Latte 30: 41-62.

Cais-Sokolinska, D., R, Danków, and J. Pikul, (2008). Physicochemical and sensory characteristics of sheep Kefir during storage. Acta Science Polland Technology Alimenttarius 7: 63-73.

Cavazzoni, V., S.A. Adami and C. Castrovilli (1998) Performance of broiler chickens supplemented with Basillus coagulans as probiotic. British Poult. Sci., 39: 526-529.

Celik, K.; Denli, M.; Erturk, M.; Ozturkcan, O. and Doran, (2001). Evaluation of dry yeast (Saccharomyces cerevisiae) compounds in the feed to reduce alfatoxin B1 (AFB1) residues and toxicity to Japanese quails *(coturnix coturnix Japonica*). J. Applied Anim. Res., 20: 2, 245-250.

Cenesiz, S., Yaman H., Ozcan A., Kart A., and G. Karademir (2008). Effects of Kefir as a probiotic on serum cholesterol, total lipid, aspartate amino transferase and alanine aminotransferase activities in broiler chicks. Medycyna Weterynaryjna., 64: 168-170.

Cho, J. H., Z. F. Zhang and L. H. Kim **(**2013). Effects of single or combined dietary supplementation of β-glucan and kefir on growth performance, blood characteristics and meat quality in broilers. British Poul. Sci., 54: 216-221.

Duncan, D. B. (1955). Multiple range and multiple ``F``test. Biometrics 11: 1-42.

Fatemi, F., A. Allameh, A. Dadkhah, M. Forouzadeh, S. Kazemnejad and R. Sharifi (2006). Changes in hepatic cytosolic glutathione S-transferase activity and expression of its class-P during prenatal and postnatal periods in rats treated with aflatoxin B1. Arch Toxical 80: 572-579.

Fermacto (http://petag.com).

Fuller, R. (1989). Probiotics in man and animals. J. Applied Bacteriology 66: 365-378.

Gibson, G. R. and M. B. Roberfroid, (1995). Dietary modulation of the human colonic micro biota: Introducing the concept of prebiotics. J. Nutrition 125: 1401–1412.

Garrote, G.L., A.G. Abraham, and De G. L. Antoni (2001). Chemical and microbiological characterisation of kefir grains. J. Dairy Res., 68: 639–652.

Ghadban, G. S., (2002). Probiotices in broiler production. A review. Al-Ghadbad Poultry Co. Ltd. Tulkum. Palestine 66: 49-58.

Hassaan, S. F., M. Elsalmoney and M.M. Fathi (2008). Relationship between triiodothyronine (t_3) and Insulin-link growth factor (IGF_1) hormones in Egypt A.E. In local chickens during growth period. Egypt Poult. Sci., 18: 251-263.

Hesna, E., Sahin and M. Yardimci (2009). Effects of Kefir as a probiotic on growth performance and carcass characteristics in Geese (*Anser anser*), J. Animal and Veterinary Advances, 8: 562-567.

IFCC (http://ifcc.org).

Jamuna, M. and K. Jeevaratnam, (2004). Isolation and characterization of lactobacilli from some traditional fermented foods and evaluation of the bacteriocin. J. General and Applied Microbiology 50: 79-90.

Jin, L. Z., Y. W. Ho, N. Abdullah, A. M. Ali and Jalaludin (1996). Antagonistic effects of intestinal Lactobacillus isolates on pathogens of chicken. Letters in Applied Microbiology, 23(2): 67-71.

Jin L. Z., Y. W. Ho, N. Abdullah, A. M. Ali and Jalaludin (1998). Effects of adherent Lactobacillus cultures on growth, weight of organs and intestinal microflora and volatile fatty acids in broilers. Anim. Feed Sci., Tech., 70: 197-209.

Karademir, G., M. A. Tunç and D. Çelebi, **(**2012). Effect of kefir on performance and egg quality of laying hens. Atatürk Üniversitesi Veteriner Bilimleri Dergisi, 7: 177-184.

Kneifel, W. and H. K. Mayer, (1991). Vitamin profiles of kefirs made from milks of different species. International J. Food Science Technology 26: 423-428.

Kralik G., Z. Milakovic and S. lvankovic (2004). Effect of probiotics supplementation on the performance and the composition of the intestinal microflora in broilers. Act Agraria Kaposvariensis 8: 23-3 1.

Maiolino R, Fioretti A, Menna L P and C. Meo, (1992). Research on the efficiency of probiotics in diet for broiler chickens. Nutrition Abstract and Reviews Series 62: 482.

Marshall, M. V., and W.M. Cole, (1985). Methods for making kefir and fermented milks based on kefir. J. Dairy Research, 52: 451-456.

Mastbaum, I., Yossilewitsh, I., Grimberg, M., Kedem, M., Vio-la, S., Rand, N., Dvorin, A., Noy, Y., Litman, (1997). Effects of the probiotic “Primalac” on broilers administered either as a feed additive or in the drinking water. 11 th European Symposium on Poultry Nutrition. August 24–28, Faaborg-Denmark.

Messens, W. and De Vuyst, (2002). Inhibitory substances produced by Lactobacilli isolated from sourdoughs-a review. International J. Food Microbiology 72: 31-43.

Midilli, M., and S.D. Tuncer, (2001). Broiler rasyonlarýna katýlan enzim ve probiyotiklerin besi performansýna etkileri. Turkish J. Anim. Sci. 25: 895-903.

Mohan-Kumar O R and K.J. Christopher (1988). The role of lactobacillus sporogenes (probiotic) as feed additive. Poult. Guide 25: 37-40.

Nahashon, S. H., H. S. Nakue and L.W. Mirosh, (1994a). Production variables and nutrient retention in single Comb white Leghorn layers fed corn-soybean meal and barley- corn- soybean meal diets supplemented with a directed fed microbials. Poultry Science, 73: 16991711.

Nahashon, S.H., Nakue, H.S., Snyder, S.P., L.W. Mirosh, (1994b). Performance of single Comb white Leghorn laying pullets fed diets supplemented with direct-fed microbials. Poultry Science, 73: 1699-1711.

Nikpiran H., Vahdatpour T., Babazadeh D. and S. Vahdatpour (2013). Effects of Saccharomyces cerevisiae, Thepax and combination of them on blood enzymes and performance of Japanese quails (*Coturnix Japonica*). The J. Animal and Plant Sciences, 23 (2): 369-375.

Onifade, A. A., (1998). Proposing fortification of foods with yeast for optimal nutrition value and salubrious effects. Nutrition & Food Science 4:223–226.

Otles, S. and C. Ozlem (2003). Kefir: A Probiotic dairy-composition, nutritional and therapeutic aspects. Pakistan J. Nutrition 2 (2): 54-59.

Ozcan, E., (2003). Proteolytic enzyme katkýlý Lactobacillus Acidophilus in addition to the performance of broiler feed, ileum, the effects of pH and microorganism populations. Master's Thesis. Ankara University, Science. ENS.

Ozyurt, B., M. Iraz, K. Koca, H. Ozyurt and S. Sahin (2006). Protective effects of caffeic acid phenethyl ester on skeletal muscle ischemia-reperfusion injury in rats. Molecular Cell Biochemistry 292: 197-203.

Quezada, T., H. Cuellar, A. G. Valdiviaand J. I. Reys (2002). Effects of aflatoxin B1 on the liver and kidneys of broiler chickens during development. Comp Biochemistry Physiology C Toxicology Pharmacology 125: 265-272.

Paryad A., M. Mahmoudi (2008). Effect of different levels of supplemental yeast (Saccharomyces cerevisiae) on performance, blood constituents and carcass characteristics of broiler chicks. African J. Agricultural Research, 3: 835-842.

Saegusa, S., M. Totsuka, A. S. Kaminogawa, and T. Hosol (2004). Candida albicans and Sacchromyces cerevisiae induce interlukin-8 production from intestinal epithelial–like Caco-2 cells in the presence of butyric acid. FEMS Immunology and Medical Microbiology 41:227-235.

SAS (2001). SAS USER`s Guide: Statistic Version, SAS Institute Inc. CARY, NC, USA.

Scholl P F, Mc Coy L, Kensler T W and G.D. Groopman (2006). Quantitative analysis and chronic dosimetry of the aflatoxin B1 plasma albumin adduct Lys-AFB1 in rats by isotope dilution mass spectrometry. Chem. Research Toxicology 19: 44-49.

Simova, E., Beshkova, D., Angelov, A., Hristozova, T., Frengova, G. and Z. Spasov (2002). Lactic acid bacteria and yeast in kefir grains and kefir made from them. J. Industrial Microbiology and Biotechnology 28: 1-6.

Sing H and A.W. Nordskog (1982). Significance of body weight as a performance parameter. Poultry Science 61: 1933-1938.

Tahara, T. and K. Kanatani (1997). Isolation and partial amino acid sequence of bacteriocins produced by Lactobacillus acidophilus. Bioscience, Biotechnology and Biochemistry 61: 884-886.

Vahdatpour T, Nikpiran H, babazadeh D, Vahdatpour S, M.A. Jafargholipour (2011). Effects of Protexin®, Fermacto® and combination of them on blood enzymes and performance of Japanese quails (*Coturnix Japonica*). Annals of Biological Research 2 (3): 283-291.

Yaman H., Ulukanli Z., Elmali M., and Y. Unal (2006). The Effect of a Fermented Probiotic, the Kefir, on Intestinal Flora of Poultry Domesticated Geese (Anser anser), Revue de Médecine Vétérinaire, 7: 379-386.

Yeo, J. and K.I. Kim (1997). Effect of feeding diets containing an antibiotic, a probiotic or yucca extract on growth and intestinal urease activity in broiler chicks. Poultry Science, 76: 381-385.

Yüksekdag, Z. N., Y. Beyatli and B. Aslim (2004). Determination of some characteristics coccoid forms of lactic acid bacteria isolated from Turkish kefirs with natural probiotic. Lebensmittel-Wissenschaft und-Technologie 7: 663-667.

Zamfir, M., Callewaert, R., Cornea, P.C., Savu, L., Vatafu, I. and De Vuyst (1999). Purification and characterization of a bacteriocin produced by Lactobacillus acidophilus IBB 801. J. Applied Microbiology 87: 923-931.

Zubillaga, M., R. Weill, E. Postaire, C. Goldman, R. Caro and J. Boccio (2001). Effect of probiotics and functional foods and their use in different diseases. Nutrition Research, 21: 569-579.

Zhang, A.W. B. D. Lee, S. K. Lee, K. W. Lee, G. H. An, K. B. Song and C. H. Lee (2005). Effects of yeast (Saccharomyces cerevisiae) cell components on growth performance, meat quality, and ileal mucosa development of broiler chicks. Poult. Sci., 84: 1015-1021.