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Study Effects of Dietary 1% Inulin as Prebiotic on Growth and Some Blood Biochemical Parameters in Male Coturnix Quails

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ABSTRACT

Background: Inulin and Oligofructose have various roles and benefits which make them suitable for use in animal feed formulations. Inulin can be used as an alternative to antibiotics in poultry diet. Oligosaccharides and inulin intake have shown a significant growth in population and diversity of the natural flora of the intestine and cecum that enhances the health of the host. **Objective:** The aim of this study was to study effects of dietary 1% inulin as prebiotic on growth and some blood biochemical parameters in male Coturnix quails. **Results:** There was no significant difference between weights of body, liver and gizzard considering the control group and the treatment group with 1% inulin. The results of the AST, CPK, CPK-MB and LDH did not show any significant differences between treatment and control groups. But there was a significant difference on ALT between treatment and control groups. By means of these findings, the ineffectiveness of 1% inulin on AST, CPK, CPK-MB and LDH factors can be resulted. **Conclusion:** Generally, the consumption of 1% inulin is not recommended for weight gaining of quails.

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INTRODUCTION

Inulin and Oligofructose have various roles and benefits which make them suitable for use in animal feed formulations (Chen, 2003, Elrayeh, 2006, Kucukersan *et al.*, 2011). Inulin can be used as an alternative to antibiotics in poultry diet (Park and Park, 2012). Oligosaccharides and inulin intake have shown a significant growth in population and diversity of the natural flora of the intestine and cecum that enhances the health of the host (Rehman *et al.*, 2008). So, nowadays the use of these materials as probiotics has grown dramatically (Sahin *et al.*, 2008). Probiotic Inulin is a non-sugar and polysaccharide herbal carbohydrate containing soluble fiber which is obtained from various plants with different degrees of polymerization (Elrayeh, 2006, Rehman *et al.*, 2008). Probiotics are non digestive materials which play a beneficial role for the host through growth stimulation and activities of one or a number of intestinal bacteria and improve the health of the host (Sahin *et al.*, 2008, Zentek *et al.*, 2003). With increasing quail breeding in Iran and the world, scientists are seeking new approaches to improve the quality and enhance the health of farmed livestock in these areas. One solution is the use of probiotics quail breeding field. In this study, the effects of 1% probiotic inulin on some biochemical parameters of quail blood have been studied. It is not a long time that biochemical test performing, using serum or plasma and other biological fluids of poultries' body, has been started in order to detect the disease (Mojabi, 2000, Nazifi, 1997). Many of chemical parameters in the biological fluids of birds in the state of health and disease not fully specified yet (Campbell and Coles, 1989, Mojabi, 2000). As a fluid tissue, blood is one of the biological fluids of the body which is subject to changes due to changes in physiological and pathological states of the body (Dein, 1986). Normal values of biochemical parameters of blood and investigating them and determining changes can assist us in identifying different physiological and pathological states.

Methodology:

All 20 male Coturnix quail were randomly selected and divided into two groups of 10 quail so that the average weight of the two groups showed no significant differences. The room temperature was $33 \pm 1^{\circ}\text{C}$ on the first day and was decreased by 2 to 3°C from the second day. And finally it was fixed on $24 \pm 2^{\circ}\text{C}$. Water and sugar solution of 5% was applied for feeding on the first day. The consumed water was the city tap water which

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was re-refined using carbon and sand filters. From the second day, the control group was fed with basal diet and the treatment group was fed with basal diet plus 1% inulin with Mr~5000 of Dahila tubers produced by SIGMA Company (By 1% inulin in the diet we mean 10 gram per 1kilogram of feed). During the entire period, feeding was performed on the ad libitum basis. Seed was analyzed and the results are given in Table 1-1. The environment was exposed to 24-hour lighting during the experiment. The airing of the room was considered to be 20cm per a cubic meter of the room. A feeding level of 5cm and a drinker of 3cm have been designated for each quail chick.

Table 1-1: Composition and chemical analysis of the quail diet.

Ingredients (%)	Diet
Corn	47.00
Sot bean meal	33
Full-fat soybean	15
Vegetable oil	1.75
Limestone	1.5
Common salt	0.30
VMP*	0.40
Chemical composition	Diet
Metabolic energy(Kca/Kg)	3200
Crude fiber (%)	2.50
Crude fat (%)	7.50
Crude protein (%)	22.00
Ash (%)	10.00
Moisture (%)	11.00

VMP: Vitamin and Mineral Premix which provides per Kg vitamin A, 1500IU; vitaminD3,5000IU; vitaminE,50mg; vitaminK3,10mg; vitaminB1,4mg; vitamin B2,8mg; vitaminB6,5mg; vitaminB12,0.025mg; niacin,50mg; pantothenic acid,20mg; folic acid,20mg; biotin,0.25mg; choline175mg and manganese,100mg; zink,150mg; iron,100mg; cupper,20mg; iodine,1.5mg; cobalt,0.5mg; selenium,0.2mg; molybdenum,1mg; magnesium,50mg.

Blood sampling and serum analysis:

After 19 days, feeding was cut in 20th day and blood sampling was taken on the 21st day from control and test groups. The blood was added into the serum tube manufactured by Eurotube Company. After clotting, the blood was centrifuged with the speed of 3000 rpm for 10 minutes and the serum was removed. In this study Creatin phosphokinase (CPK), Creatin phosphokinase –MB (CPK-MB), Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST), Lactate Dehydrogenase (LDH) review was performed using Kinetik method, and all the introducing kits in this study are manufactured by Pars Azmoon Company. After sampling the body was weighed. Then after dissection liver and gizzard were also weighed using scale. Precision of the scale is 0.1 gram.

Statistical Analysis:

All raw data of this experiment was investigated by SPSS software version 15.00. The comparison T-test was used to analyze the data. Mean and standard deviation (std.deviation) was used to evaluate the data. Data with 5% level ($X < 0.05$) of significance were considered statistically significant.

Results:

The results of the body, liver and gizzard weighing have been placed in Table I. there was no significant difference between weights of body, liver and gizzard considering the control group and the treatment group with 1% inulin. Also the results of serum biochemical parameters have been placed in Table II. The results of the AST, CPK, CPK-MB and LDH did not show any significant differences between treatment groups and control groups. But there was a significant difference on ALT between treatment groups and control groups.

Table I: Body weight, liver weight and Gizzard weight Results (Mean \pm Std.Deviation).

Parameter	Control group	Treatment group	P-value
Body weight	86.460 \pm 10.2992	86.360 \pm 6.5742	0.975
Liver weight	2.160 \pm 0.2547	1.980 \pm 0.2860	0.297
Gizzard weight	3.320 \pm 0.3553	3.360 \pm 0.3921	0.867

Table II: Blood biochemical parameters analysis Results (Mean \pm Std.Deviation).

parameter	Control group	Treatment group	P-value
ALT (IU/L*)	18.20 \pm 11.497	6.20 \pm 0.789	0.011
AST (IU/L)	197.60 \pm 8.475	228.20 \pm 52.592	0.091
CPK (IU/L)	963.80 \pm 581.526	998.40 \pm 449.075	0.817
CPK-MB (IU/L)	276.00 \pm 44.875	161.80 \pm 170.765	0.093
LDH (IU/L)	920 \pm 426.448	848.60 \pm 289.743	0.473

*IU/L: International Unit per Liter

Discussion:

The changes of biochemical parameters of Quail blood can show them depended on Environment, sex and breeding (Dein, 1986). ALT activity varies within the tissues of different species of birds. Increased serum ALT activity has been reported in hepatic disorders of birds of prey, poultry, ducks and parrots (Compbell and Coles, 1989, Dein, 1986). Some researchers believe that the level of serum ALT does not increase in every cases of hepatic disorders of birds, hence, the measurement of ALT serum activity is not considered as a useful diagnostic test for hepatic disease of birds (Compbell and Coles, 1989, Dein, 1986, Mojabi, 2000). In this study, there was significant difference at serum ALT level between control and treatment groups with 1% inulin, so that the consumption of the 1% inulin reduces the serum ALT level. With regard to the distribution of AST enzyme in tissues of different species of birds varies, the maximum activity of the enzyme occurs in the liver and skeletal muscle (Dein, 1986, Nazifi, 1997). Serum AST is not considered as a hepatic enzyme in birds. However, the increasing activity through the incurred damage to the hepatocellular in chickens, turkeys, parrots and ducks, have been observed and reported (Compbell and Coles, 1989, Nazifi, 1997). If the activities of serum AST are higher than 230IU/L, it should be considered as abnormal. The average increase in serum AST has been reported as 2 to 4 times more than the normal amount of damage to the soft tissue (Compbell and Coles, 1989, Dein, 1986). In this study, there was no significant difference at AST enzyme level between control and treatment groups with 1% inulin. LDH is a non-specific enzyme that is present in all body tissues and has 5 different isoenzymes (Kaneko *et al.*, 2008, Nazifi, 1997, Tietz *et al.*, 1994). Maximum LDH activity is in the heart and hepatic muscles and lungs (Compbell and Coles, 1989, Dein, 1986, Mojabi, 2000). In this study, there was no significant difference at serum LDH level between control and treatment groups with 1% inulin that can function as a sign of health in heart, skeletal and hepatic muscles, and lungs. Serum CPK of most birds has been reported as 100 to 200 international units per liter (Compbell and Coles, 1989, Dein, 1986, Mojabi, 2000, Nazifi, 1997). Serum CPK activity of birds have been reported in physical exercises, neurological trauma, lead poisoning, Chlamydiosis and bacterial sepsis (Compbell and Coles, 1989, Dein, 1986, Nazifi, 1997). CPK levels of control and treatment Quails is higher than normal levels of most birds. However, there is no significant difference between control and treatment groups. CPK enzyme has 3 CPK-MM, CPK-MB and CPK-BB isoenzymes that most of cells contain CPK. But there is enough CPK-MB only in the heart and skeletal muscles that varies through the confusions related to these organs (Compbell and Coles, 1989, Dein, 1986, Mojabi, 2000). Absence of a significant difference between control and treatment groups at CPK-MB levels, in this study, shows that there has been no trauma in heart tissues through the consumption of 1% inulin. No significant difference was observed at weight gaining levels through the investigation of weight variations between control and treatment groups. In other words, the consumption of 1% inulin, has not led to a significant change in the rate of weight gaining between control and treatment groups. Also, no significant difference was achieved in the rate of liver and gizzard weight variations between treatment and control groups. In a research conducted by M.K.Kucukersan *et al.* in 2011, the consumption of 1% inulin in Ross-308 chickens did not make any significant difference in body weight (Kucukersan *et al.*, 2011). Also in a research conducted by T. Sahin *et al.* in 2008, it was observed that the consumption of oligosaccharides did not make any significant effect on the amount of weight change between treatment and control groups (Sahin *et al.*, 2008).

Conclusion:

Nevertheless, the consumption of 1% inulin leads to significant differences only in serum ALT and has no significant effect on any of the studied factors. By means of these findings, the ineffectiveness of 1% inulin on AST, CPK, CPK-MB and LDH factors can be resulted. Generally, the consumption of 1% inulin is not recommended for weight gaining of quails. But from the perspective of the immune system of quails, the study of natural flora needs more researches.

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