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Effect of dietary yeast on the performance and biochemical profile in Japanese quails

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Abstract
The objective of this study was to investigate the effect of supplementation of Dietary baker's *yeast* as a probiotic on body performance and biochemical profile of Japanese quails (*Coturnix* coturnix japonica). In this experiment a total of 96 day-old unsexed, growing Japanese quails were equally divided into three groups of 32 birds in each group. The experiment was terminated when birds were 6 weeks old. The standard basal diet was fed in first group (G1), 5% and 10% level of baker's yeast was supplemented in basal diet for second group (G2) and third group (G3) respectively. Feed and water was supplied *ad libitum* for all the birds. Body performance was determined by measuring feed intake, body weight gain and feed conversion ration. At the end of the experiment blood samples were taken to determine some blood plasma constituents. The results obtained in this study showed that, supplementation of dietary baker's yeast had positive effect on production performance and blood biochemical profile in Japanese quails.

Keywords: Japanese quails, dietary yeast, body performance, biochemical profile, probiotics

Introduction
Japanese quails (*Coturnix* coturnix japonica) have become an important live stock because it has a small body size, easy to handled, large number of birds can be kept in a limited space, high egg production, many offspring can be available from certain number of parents. It is also used in embryological studies (Ayasan and Okan, 2001) [1]. Quail eggs are rich in protein and good source of iron, phosphorus, riboflavin, and selenium (Bing, 2011) [2].
Probiotics are live microorganisms which are mainly derived from certain bacteria, fungi and *yeast* cell. Yeast (*Saccharomyces cerevisiae*) is one of the most widely used probiotics. It has been fed to animals and poultry. *Yeast* is a 'single cell protein' the production is originated in Germany during World War – I, when the baker's *yeast*, was grown with molasses as the carbon, energy and nitrogen source for consumption as a protein supplement. It is known that, Mannan oligosaccharide and Fructo-oligosaccharides are derived from cell wall of *yeast* and shown in suppressing enteric pathogens and modulating the immune system in poultry (santin *et al.,* 2001; Spring *et al.*, 2000; Iji *et al.*, 2001) [10, 12, 5]. These properties led researchers to use *yeast* culture as probiotic feed additives in J. quails diet. There was a limited number of studies reported on effect of dietary *yeast* on performance and blood biochemical profile in Japanese quails. Therefore, the present study was conducted to investigate the effect of supplementation of dietary baker's *yeast* as a probiotic on body performance and blood biochemical profile of Japanese quails

Materials and Methods
In this study, a total of 96 laying Japanese quails aged 25 weeks were randomly assigned to 12 cages of 8 birds each and cages were allocated to three groups with four replication per treatment. The birds were housed in standard cages (40x40x25 cm^3) in a temperature controlled house at 73^0 F. All the birds had free access to feed and water. The photoperiod was 16 hrs (Vatsalya and Kashmiri, 2011) [13]. Prior to the supplementation of yeast in the experimental diets, all the birds were fed *ad libitum* for 7 days for acclimatization. The birds of three groups were fed with experimental diets as follows, In the first group (G_1) was fed with control/basal diet (Table 1), in the second group (G_2) was fed with 5% level of baker's *yeast* in

the basal diet and in the third group (G_3) was fed with 10% level of baker's *yeast* in the basal diet. The experimental period lasted for 6 weeks.

Table 1: Ingredients and chemical composition of basal diet:

Ingredients	%
Ground yellow corn	57.83
Soya bean meal	32.94
Fish meal	3.50
Corn Gluten	3.48
Di calcium phosphate	0.33
Limestone	1.16
DL-Methionine	0.09
Lysine	0.07
Iodized sodium chloride	0.30
Minerals and vitamins premix	0.30
Calculated composition	
Crude protein (%)	24.0
Metabolic energy (Kcal/kg)	2900.0
Calorie/protein ratio (C/P)	120.83
Calcium (%)	0.80
Phosphorus (%)	0.30

The body weight (g/bird), body weight gain (g/bird) and feed intake (g) of birds per replicate were recorded on individual basis at weekly intervals and average values were recorded. Feed conversion ratio (FCR) was also calculated weekly. FCR was calculated by dividing the feed intake by body weight gain (Quigley *et al.*, 1997) [9]. At 6 weeks of age, blood samples from randomly 8 birds of each treatment, were collected from the wing vein in heparinized tubes and centrifuged at 3000 rpm / 20 minutes. The plasma was obtained and immediately stored at -20^0 C till analysis. Total protein, albumin, total lipids and SGOT and SGPT were determined according to biochemistry kit methods. The total globulin values were calculated by subtracting the values of total albumin from those of total protein for each sample.

Data were statistically analyzed using the analysis of variance. Significant difference between treatment means were calculated according to Snedecor and Cochran (1980) [11].

Results and Discussion

The feed ingredients used in the control group and treatment group were same but 5% and 10% level of yeast was supplemented in group-2 and group-3 respectively. The effect of yeast culture on body weight gain, feed intake and feed conversion are shown in table2: It was observed that, yeast at levels of 5% and 10% to the basal diet improved (P>0.05) body weight gain.

Table 2: Effect of dietary treatments on performance of growing Japanese quails:

Item	Age in weeks	Treatments		
		Control group	5% yeast	10% yeast
Body weight gain	0 to 2	41.63^a ± 0.06	44.96^b ± 2.07	47.83^c ± 1.93
	2 to 4	77.31^a ± 0.03	84.37^b ± 1.05	95.74^c ± 2.23
	4 to 6	86.10^a ± 1.07	90.73^b ± 2.29	112.38^c ± 0.14
	0 to 6	204.94^a ± 1.16	219.96^b ± 5.41	255.95^c ± 4.30
Feed intake	0 to 2	40.51^a ± 1.24	43.04^b ± 2.25	45.42^c ± 1.26
	2 to 4	76.29^a ± 1.10	82.81^b ± 0.18	92.36^c ± 1.53
	4 to 6	85.23^a ± 0.38	88.14^b ± 1.17	99.81^c ± 0.39
	0 to 6	202.03^a ± 2.72	213.99^b ± 3.60	237.59^c ± 2.93
Feed conversion ratio	0 to 2	0.973 ± 2.35	0.957 ± 1.08	0.949 ± 1.53
	2 to 4	0.986 ± 1.06	0.981 ± 1.83	0.964 ± 0.68
	4 to 6	0.989 ± 2.86	0.971 ± 0.93	0.887 ± 2.78
	0 to 6	1.985 ± 2.34	0.972 ± 1.28	0.928 ± 0.68

In the present study, the data illustrated in table: 2 indicated that, bakers dried yeast supplementation significantly reduced feed intake, but the body weight gain was significantly higher, meanwhile feed conversion ratio showed significant improvement due to yeast supplementation. This positive enhancement in feed conversion efficiency was confirmed by Zeweil (1997) [14] and Chumpawadee *et al.*, (2009) [3]. The positive response on body weight gain as a result of adding yeast may be due to mannan oligosaccharides (MOS) from yeast cell walls (Newman and Newman, 2001; O'Quinn *et al.*, 2001) [6, 7]. Some research studies suggest that MOS may improve growth performance in young pigs (Davis *et al.*, 1999; Pettigrew, 2000) [4, 8] reported that supplemented yeast increased weight gain and feed conversion ration of broilers.

The biochemical changes in plasma total protein, albumin, globulin, total lipids, SGOT and SGPT were studied in this experiment. The data illustrated in table: 3 indicated that, supplementation of yeast at 10% level to Japanese quails diet enhanced total plasma protein and albumin significantly (P>0.05) as compared to the controlled diet. However, the significantly higher (P>0.05) plasma albumin value was noticed when quails fed diet contain 5% level of yeast. The greatest improvement (P>0.05) in globulin was recorded when quails fed dietary yeast at 10% level.

Table 3: Effect of dietary treatments on plasma biochemical profile:

Item	Treatments		
	Control group	5% yeast	10% yeast
Total Protein (g/dL)	3.45^c ± 0.03	3.617^b ± 0.02	4.503^a ± 0.08
Albumin (g/dL)	2.280^c ± 0.009	2.637^a ± 0.45	2.445^b ± 0.25
Globulin (g/dL)	1.170^c ± 0.007	1.867^b ± 0.054	2.202^a ± 0.24
Total Lipids (mg/dL)	702.7^a ± 0.05	678.0^b ± 4.71	669.7^b ± 1.02
SGOT (U/L)	138.6^a ± 1.127	123.2^b ± 3.08	115.3^b ± 2.02
SGPT (U/L)	166.7^a ± 0.019	142.3^b ± 0.54	151.0^b ± 0.16

The data illustrated in table: 3 revealed that, the lowest (P>0.05) values of total lipids and SGOT were observed when birds fed diets contain 5% level of yeast. However, no significant difference (P>0.05) in total lipids and SGOT were detected by dietary addition of yeast at 10% level. The plasma SGPT values were decreased significantly (P>0.05) when quails fed with 5% level of yeast compared to control diet, however there was no significant difference of SGPT when birds fed on 10% dietary yeast.

The positive effect on plasma total protein, albumin, globulin, total lipids, SGOT and SGPT may be due to that the number of anaerobic and cellulytic bacteria were increased when the experimental diet was supplemented with yeast which enhanced lactate utilization and moderate pH of gut, therefore, yeast improves the nutrients digestibility and growth performance (Abdel-Azeem, 2002), revealed that dietary supplement of yeast (*S. cerevisiae*) improves the body performance and blood biochemical profile in broilers. These above results may explain the significant effects of dietary yeast in improving the metabolic process.

Conclusion

Dietary yeast have great potential to beneficially affect the gut microflora and hence improves the digestibility and health in Japanese quails. The present study confirms that, the supplementation of baker's yeast as a probiotic in growing Japanese quails diets significantly improved the body performance and blood biochemical profile. It could be concluded that, dietary yeast to growing quails up to 10% level improved the performance and biochemical profile.

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