Original Research

Influence of Dietary Supplementation of Graded Levels of Yeast Cell Extracted Nucleotides (YEN) at Different Age Intervals on Carcass Characteristics of Commercial Broilers

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Abstract

An experiment was conducted to evaluate the influence of dietary supplementation of graded levels of Yeast cell extracted nucleotide (YEN) at different age intervals on carcass characteristics of commercial broilers. In a completely randomized design, 300 day-old straight run commercial broiler chicks were assigned to ten treatments with each treatments consisting of three replicates with ten chicks in each. Basal diet (control) T1 was prepared without supplementation of yeast extracted nucleotides for day 1 to 42 days of experimental period. The birds in treatment groups T2, T3 and T4 were fed with control diet supplemented with 1, 2 and 3 per cent yeast extracted nucleotides, respectively from day 1 to 14 days and rest of the day upto 42 days control diet was fed. The birds in treatment groups T5, T6 and T7 were fed with control diet supplemented with 1, 2 and 3 per cent yeast extracted nucleotides, respectively from day 1 to 28 days and rest of the day upto 42 days control diet was fed. The birds in treatment groups T8, T9 and T10 were fed with control diet supplemented with 1, 2 and 3 per cent yeast extracted nucleotides, respectively from day 1 to 42 days. The results of feeding graded levels of YEN up to 14 days did not have any significant effect on different carcass characteristics, however at the end of 28 and 42 days results revealed a significant ($P \leq 0.05$) difference in dressing percentage, thigh yield (%) breast yield (%) and meat: bone ratio, whereas no significant ($P \geq 0.05$) difference was observed with respect to other carcass characteristics among various treatments. Based on the results it was concluded that feeding of 2 and 3 per cent YEN up to 28 and 42 days resulted in similar improvement on major carcass characteristics, indicating that feeding 2 per cent YEN up to 28 days would result in optimal results and better economy in commercial broiler production.

Key words: Broilers, Carcass, Dressing Percentage, Nucleotides, Yeast

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Introduction

The major cost of production in poultry mainly depends on nutrition. Feed cost alone accounts for nearly 75 percent of the recurrent expenditure. Various methods and methodology has been employed to reduce the feed cost. Nutritionists have been searching for biological protein source to be included in the diets. Over the past few decades, antibiotic growth-promoters (AGPs) have been used in poultry feed to prevent bacterial infections, reduce mortality rate, and improve growth performance and production (Castanon, 2007). However, inappropriate and excessive use of AGPs in animal feeds has led to antibiotic resistance development which is one of the major public health concerns.

Yeast-derived products including ß1, 3-1, 6-glucan, mannan polysaccharides and nucleotides have been considered as one of the potential alternative supplements because of their growth promoting effects, effects on improving carcass traits and immune modulatory properties (Brummer *et al.*, 2010). It has been demonstrated that cell wall polysaccharides derived from the yeast such as *Saccharomyces cerevisiae* could cause significant improvement in growth performance by facilitating gut development, in turn improves the carcass quality and providing competitive binding sites for pathogenic bacteria (Muthusamy *et al.*, 2011). Dietary nucleotides have an essential role in the development and proliferation of tissues and cells with a rapid cell turnover such as the intestine, visceral organs and lymphocytes where *de novo* synthesis of nucleotides cannot meet their demand in such rapidly proliferating tissues. Therefore, adding nucleotides to diets may spare the energetic cost of *de novo* synthesis. Considering the role of nucleotides in the development of cells with rapid turnover (i.e. epithelial cells and lymphocytes) dietary nucleotides can probably modulate the carcass characteristics and immune response of broiler chickens (Hess and Greenberg, 2012). The extensive use of antibiotics in poultry with the purpose of promoting growth rate, increasing feed conversion efficiency and for the prevention of intestinal infections have led to an imbalance of the beneficial intestinal flora and the appearance of resistant bacteria. With increasing concerns about antibiotic resistance, there is increasing interest in finding alternatives to antibiotics for poultry production. Natural feed additives, such as live probiotics with yeast and its derived products have potential to reduce enteric disease in poultry and subsequent contamination of poultry products. The yeast and its derivative will helps in growth promoter, modulation of intestinal microflora, pathogen inhibition and development of immune response of poultry (Gupta and Das, 2013)

Based on the above observations, it was hypothesized that yeast cell derived nucleotide could become a significant source of yeast components that can stimulate the carcass traits of birds. Hence, the present study has been carried out to study the influence of supplementing dietary graded levels of yeast cell extracted nucleotides on carcass characters in broilers.

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Review of Literature

Nucleotides are extracted from the cell content of a specific strain of *Saccharomyces cerevisiae* yeast. It is a rich source of digestible amino acids with a crude protein content of 45 per cent. Nucleotides are the building blocks of DNA and RNA. Nucleotide synthesis is important for tissues and organs such as brain, bone marrow and intestine. Nutritionists are thinking forward to formulate neonatal and starter diets incorporating nucleotides source.

Rutz *et al.* (2004) studied the effect of NuPro on broiler chicken. Carcass cut up parts like carcass yield, abdominal fat and cut up parts viz., drumstick, thigh, wing and breast were studied by slaughtering birds at 42 days of age. They did not observe any significant difference between the control and treatment groups with respect to any of the carcass cut up parts. The feather weight was not statistically influenced by the nucleotide supplementation for 1-7 days and in 38-42 days in addition to 1-7 days group. But numerically higher feather weight was observed in Nupro fed group birds. Marina *et al.* (2006) conducted a study to determine the effect of ascogen, a biogenic performance enhancer, carcass characteristics of heavy–strain Japanese quails (*Coturnixcoturnix japonica*) and observed that at 35 days of age a significantly higher carcass weight, carcass yield, wing weight and drumstick weight compared to that of control. Zauk *et al.* (2006) evaluated the broilers fed on graded levels of Nupro (0, 1, 2, 3 and 4 per cent) for 1-7 days age with respect to carcass traits. They did not notice any significant difference in carcass traits between groups.

Awad *et al*. (2009) reported that the synbiotic supplemented group had a greater ($p<0.05$) carcass percentage as compared to the control group and probiotic supplemented group but the differences between control group and probiotic supplemented group were non-significant. The neck percentage was significantly higher in the symbiotic group compared to prebiotic, but the differences between prebiotic, probiotic and control groups were found to be non-significant. The mean cut-off parts such as neck, wing, breast, back, thigh and drumstick expressed as percentage of eviscerated weight were 7.30, 10.87, 33.83, 18.02, 16.49 and 13.02 per cent, respectively. Fathi *et al.* (2012) observed that the inclusion of yeast slightly improved carcass percentage and increase in thigh percentage. They also observed that the birds given the highest level of yeast (1.5 g/kg) had significantly ($P\leq0.05$) higher percentage of major and minor breast muscles compared with others that fed basal diet. Sarangi *et al.* (2016) observed no significant ($p>0.05$) difference in the carcass traits with respect to dressing percentage, carcass percentage, heart weight, liver weight and gizzard weight, wing percentage, breast percentage, back percentage, thigh percentage, and drumstick percentage in Cobb broilers supplemented with prebiotic, probiotic, and synbiotic.

Materials and Methods

In a completely randomized design, 300 day-old straight run commercial broiler chicks were assigned to ten treatments with each treatments consisting of three replicates with ten chicks in each. Basal diet (control)

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T_1 was prepared using corn and soya-bean meal as per the BIS (2007) standards (as per commercial requirement) without supplementation of yeast extracted nucleotides for day 1 to 42 days of experimental period. The birds in treatment groups T_2, T_3 and T_4 were fed with basal diet (control) supplemented with 1, 2 and 3 per cent yeast extracted nucleotides, respectively from day 1 to 14 days and rest of the day upto 42 days basal diet (control) was fed. The birds in treatment groups T_5, T_6 and T_7 were fed with basal diet (control) supplemented with 1, 2 and 3 per cent yeast extracted nucleotides, respectively from day 1 to 28 days and rest of the day upto 42 days basal diet (control) was fed. The birds in treatment groups T_8, T_9 and T_{10} were fed with basal diet (control) supplemented with 1, 2 and 3 per cent yeast extracted nucleotides, respectively from day 1 to 42 days (Table 1). All the birds were vaccinated against New castle disease and Infectious Bursal disease as per the schedule. Feed and water was provided ad libitum. Birds were reared on under standard managemental practices. The carcass characters will be recorded on 14th, 28th and 42nd day of experiment. The two birds from each replicate in T_1 to T_4 on 14th day, T_1 to T_7 on 28th day and T_1 to T_{10} on 42nd day, respectively were slaughtered to study the carcass traits like dressing percentage, yield of drumsticks, yield of thigh, yield of wings, yield of beast weights, meat to bone ratio, abdominal fat and expressed as the per cent of pre slaughter bird weight (% of live weight). The design of the experiment is complete randomized design (CRD) with one way analysis. All the data pertaining to various carcass characters were analyzed by standard procedure described by Snedecor and Cochran (1980) and by using SPSS 20 statistical software.

Table 1: Description of the dietary treatment and period of feeding

Treatment	Diet	Duration of Treatment with YEN
T_1	Control basal Diet	
T_2	Control basal diet + 1% YEN	1-14 days
T_3	Control basal diet + 2% YEN	1-14 days
T_4	Control basal diet + 3% YEN	1-14 days
T_5	Control basal diet + 1% YEN	1-28 days
T_6	Control basal diet + 2% YEN	1-28 days
T_7	Control basal diet + 3% YEN	1-28 days
T_8	Control basal diet + 1% YEN	1-42 days
T_9	Control basal diet + 2% YEN	1-42 days
T_{10}	Control basal diet + 3% YEN	1-42 days

Result and Discussion

The results of the feeding graded levels of yeast cell extracted nucleotides on various carcass traits (% of live weight) at 14th day of the experiment reveled that, the dressing percentage in group T_1, T_2, T_3 and T_4 were 64.13, 64.26, 65.03 and 65.13, breast weight yield (%) were 29.45, 29.34, 29.98, 29.98, thigh yield (%) were 14.17, 14.15, 14.90 and 14.96, respectively. The yield of drumstick (%) were 14.03, 13.92, 14.44 and 14.53, wing yield (%) were 8.37, 8.34, 8.51 and 8.44, back yield (%) were 18.89, 18.93, 18.75 and

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18.88 and yield of neck (%) were 7.82, 7.77, 7.94 and 8.04 in group T_1, T_2, T_3 and T_4 respectively. The per cent abdominal fat (%) were 1.17, 1.19, 1.23 and 1.25 and the meat: bone ratio were 0.848, 0.860, 0.848 and 0.818, respectively in all the four treatments. ANOVA revealed no significant (P>0.05) difference in all the carcass traits during 14th day of the experiment between the control and various treatments (Table 2).

The results of the feeding graded levels of yeast cell extracted nucleotides (YEN) on different carcass traits (% of live weight) at 14th day of the experiment in commercial broilers revealed no significant (P>0.05) difference in the dressing percentage, breast weight yield (%), thigh yield (%), yield of drumstick (%), wing yield (%), back yield (%), yield of neck (%), abdominal fat (%) and the meat: bone ratio among control and different levels of YEN (1, 2 and 3 %). It is revealed that feeding graded levels of YEN up to 14 days in commercial broilers did not have any significant effect on different carcass characteristics.

Table 2: Effect of feeding graded levels of yeast cell extracted nucleotides (YEN) on carcass traits (% of live weight) at the 14th day in commercial broilers

Experimental Group	Dressing %	Breast Weight %	Thigh Weight %	Drumstick Weight %	Wing Weight %	Back Weight %	Neck Weight %	Abdominal Fat %	Meat: Bone Ratio
T_1	64.13 ± 0.52	29.45 ± 0.30	14.17 ± 0.29	14.03 ± 0.37	8.37 ± 0.24	18.89 ± 0.39	7.82 ± 0.11	1.17 ± 0.10	0.848 ± 0.03
T_2	64.26 ± 0.83	29.34 ± 0.67	14.15 ± 0.23	13.92 ± 0.34	8.34 ± 0.18	18.93 ± 0.33	7.77 ± 0.28	1.19 ± 0.10	0.860 ± 0.02
T_3	65.03 ± 0.31	29.98 ± 0.65	14.90 ± 0.47	14.44 ± 0.33	8.51 ± 0.27	18.75 ± 0.54	7.94 ± 0.25	1.23 ± 0.09	0.848 ± 0.03
T_4	65.13 ± 1.21	30.03 ± 0.90	14.96 ± 0.45	14.53 ± 0.35	8.44 ± 0.15	18.88 ± 0.67	8.04 ± 0.30	1.25 ± 0.08	0.818 ± 0.02

At the end of 28th day, the dressing percentage (%) in group T_1, T_2, T_3, T_4, T_5, T_6 and T_7 were 62.99, 62.98, 63.12, 63.24, 63.09, 67.26 and 67.83, respectively. Statistical analysis revealed a significant (P≤0.05) difference in dressing percentage between the treatments. The group T_7 and T_6 recorded the highest and similar dressing percentage and were significantly different from other treatments. However, no significant (P>0.05) difference was observed in the dressing percentage in group T_1, T_2, T_3, T_4 and T_5 (Table 3).

Table 3: Effect of feeding graded levels of yeast cell extracted nucleotides (YEN) on carcass traits (% of live weight) at the 28th day in commercial broilers.

Experimental Group	Dressing %	Breast Weight %	Thigh Weight %	Drumstick Weight %	Wing Weight %	Back Weight %	Neck Weight %	Abdominal Fat %	Meat: Bone Ratio
T_1	62.99 ± 0.19^b	31.17 ± 0.43^b	14.86 ± 0.32	15.13 ± 0.17	8.20 ± 0.14	17.64 ± 0.48	7.64 ± 0.36	1.46 ± 0.17	1.75 ± 0.05^b
T_2	62.98 ± 0.72^b	31.37 ± 0.26^b	14.95 ± 0.22	15.33 ± 0.33	8.14 ± 0.12	17.61 ± 0.38	7.76 ± 0.38	1.50 ± 0.19	1.77 ± 0.06^b
T_3	63.12 ± 0.29^b	31.46 ± 0.13^b	15.16 ± 0.38	15.41 ± 0.21	8.30 ± 0.27	17.82 ± 0.27	7.78 ± 0.35	1.59 ± 0.28	1.81 ± 0.05^b
T_4	63.24 ± 0.74^b	31.50 ± 0.28^b	15.22 ± 0.15	15.44 ± 0.22	8.29 ± 0.17	17.79 ± 0.34	7.78 ± 0.34	1.64 ± 0.28	1.85 ± 0.03^b
T_5	63.09 ± 0.60^b	31.50 ± 0.29^b	15.09 ± 0.42	15.43 ± 0.32	8.26 ± 0.21	17.78 ± 0.47	7.78 ± 0.21	1.53 ± 0.38	1.81 ± 0.03^b
T_6	67.26 ± 0.53^a	33.01 ± 0.49^a	15.77 ± 0.26	15.47 ± 0.25	8.28 ± 0.18	17.49 ± 0.42	7.74 ± 0.23	1.54 ± 0.25	2.58 ± 0.05^a
T_7	67.83 ± 0.46^a	33.04 ± 0.40^a	15.80 ± 0.28	15.52 ± 0.23	8.28 ± 0.13	17.52 ± 0.36	7.73 ± 0.28	1.60 ± 0.17	2.67 ± 0.05^a

^{a,b} means in the same column with no common superscript differ significantly (P≤0.05)

The yield of breast (%) in group T_1, T_2, T_3, T_4, T_5, T_6 and T_7 at 28th day were 31.17, 31.37, 31.46, 31.50, 31.50, 33.01 and 33.04, respectively. Statistical analysis revealed a significant (P≤0.05) difference in

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dressing percentage between the treatments. The group T_7 and T_6 recorded the highest and similar breast yield and were significantly different from other treatments. However, no significant (P>0.05) difference was observed in the breast yield in T_1, T_2, T_3, T_4 and T_5. The yield of thigh (%) in group T_1, T_2, T_3, T_4, T_5, T_6 and T_7 at 28th day were 14.86, 14.95, 15.16, 15.22, 15.09, 15.77 and 15.80, the drumstick yield (%) were 15.13, 15.33, 15.41, 15.44, 15.43, 15.47 and 15.52 and the wing yield (%) were 8.20, 8.14, 8.30, 8.29, 8.26, 8.28 and 8.28, respectively. The yield of back (%) was 17.64, 17.64, 17.82, 17.79, 17.78, 17.49 and 17.52, the yield of neck (%) were 7.64, 7.76, 7.78, 7.78, 7.78, 7.74 and 7.73, respectively in groups T_1, T_2, T_3, T_4, T_5, T_6 and T_7 at 28th day. ANOVA revealed no significant (P>0.05) difference in yield of thigh, drumstick, wing, back and neck at 28thday of the experiment between the treatments. The meat: bone ratio in group T_1, T_2, T_3, T_4, T_5, T_6 and T_7 at 28th day were 1.75, 1.77, 1.81, 1.85, 1.81, 2.58 and 2.67, respectively. Statistical analysis revealed a significant (P≤0.05) difference in meat: bone ratio between the treatments. The group T_7 recorded the highest meat: bone ratio followed by group T_6, but the difference between them was non-significant, whereas both group T_6 and T_7 were significantly different from other treatments. However, no significant difference was observed in the meat: bone ratio in group T_1, T_2, T_3, T_4 and T_5.

At the end of 28th day, results revealed a significant (P≤0.05) difference in dressing percentage, breast yield (%) and meat: bone ratio, whereas no significant (P>0.05) difference was observed with respect to thigh yield (%), yield of drumstick (%), wing yield (%), back yield (%), yield of neck (%) and abdominal fat (%) between the treatments. It was evident that significantly (P≤0.05) higher dressing percentage, breast yield (%) and meat: bone ratio was observed in birds fed 2 per cent (T_6 and T_9) and 3 per cent (T_7 and T_{10}) YEN up to 28 days as compared to control (T_1), 1, 2 and 3 per cent of YEN (T_2, T_3 and T_4) up to 14 days and 1 per cent (T_5) YEN fed up to 28 days. The results clearly indicated that feeding graded levels of YEN at different interval did not significantly (P>0.05) influence thigh yield (%), yield of drumstick (%), wing yield (%), back yield (%), yield of neck (%) and abdominal fat (%) in birds fed 1, 2 and 3 per cent (T_5, T_6 and T_7) YEN up to 28 days, control (T_1) and 1, 2 and 3 per cent (T_2, T_3 and T_4) of YEN up to 14 days. At the end of 42nd day, the dressing percentage (%) in group T_1, T_2, T_3, T_4, T_5, T_6, T_7, T_8, T_9 and T_{10} were 68.51, 68.81, 68.79, 69.79, 69.15, 74.23, 74.84, 69.77, 74.70 and 75.06, respectively. Statistical analysis revealed a significant (P≤0.05) difference in dressing percentage between the treatments. The group T_{10} followed by T_7 and T_9 recorded the highest dressing percentage with no significant (P>0.05) difference between them, whereas they were significantly different from other treatments (Table 4). The breast yield (%) in group T_1, T_2, T_3, T_4, T_5, T_6, T_7, T_8, T_9 and T_{10} were 33.92, 33.19, 34.20, 34.07, 33.44, 35.70, 36.19, 33.66, 35.77 and 35.91, respectively. Statistical analysis revealed a significant (P≤0.05) difference in breast yield between the treatments.

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Table 4: Effect of feeding graded levels of yeast cell extracted nucleotides (YEN) on carcass traits (% of live weight) at the 42th day in commercial broilers

Experimental Group	Dressing %	Breast Weight %	Thigh Weight %	Drumstick Weight %	Wing Weight %	Back Weight %	Neck Weight %	Abdominal Fat %	Meat: Bone Ratio
T_1	68.51 ± 0.67^b	33.92 ± 0.47^b	14.31 ± 0.26^b	16.97 ± 0.14	8.03 ± 0.07	17.46 ± 0.30	6.45 ± 0.23	1.42 ± 0.10	2.78 ± 0.05^d
T_2	68.81 ± 0.60^b	33.19 ± 0.24^b	14.18 ± 0.23^b	16.66 ± 0.17	8.04 ± 0.05	17.49 ± 0.25	6.42 ± 0.14	1.39 ± 0.10	2.80 ± 0.06^d
T_3	68.79 ± 0.82^b	34.20 ± 0.41^b	14.32 ± 0.23^b	17.00 ± 0.36	8.08 ± 0.15	17.52 ± 0.34	6.42 ± 0.07	1.47 ± 0.13	2.84 ± 0.05^d
T_4	69.79 ± 0.55^b	34.07 ± 0.22^b	14.30 ± 0.11^b	16.99 ± 0.27	8.09 ± 0.11	17.55 ± 0.17	6.37 ± 0.24	1.40 ± 0.15	2.88 ± 0.03^d
T_5	69.15 ± 0.39^b	33.44 ± 0.32^b	14.22 ± 0.12^b	16.95 ± 0.17	8.02 ± 0.16	17.47 ± 0.33	6.40 ± 0.03	1.49 ± 0.19	2.84 ± 0.03^d
T_6	74.23 ± 0.74^a	35.70 ± 0.42^a	15.74 ± 0.21^a	17.05 ± 0.19	8.02 ± 0.14	17.07 ± 0.23	6.53 ± 0.20	1.41 ± 0.10	3.71 ± 0.04^c
T_7	74.84 ± 1.54^a	36.19 ± 0.56^a	15.85 ± 0.36^a	17.09 ± 0.16	8.06 ± 0.25	17.17 ± 0.38	6.48 ± 0.14	1.33 ± 0.07	3.80 ± 0.04^{bc}
T_8	69.77 ± 0.29^b	33.66 ± 0.40^b	14.61 ± 0.30^b	16.93 ± 0.44	7.93 ± 0.15	17.53 ± 0.16	6.62 ± 0.03	1.37 ± 0.16	2.86 ±0.03^d
T_9	74.70 ± 0.59^a	35.77 ± 0.51^a	15.92 ± 0.13^a	17.06 ± 0.11	8.04 ± 0.16	17.16 ± 0.13	6.56 ± 0.12	1.34 ± 0.10	3.87 ±0.05^{ab}
T_{10}	75.06 ± 1.14^a	35.91 ± 0.46^a	16.10 ± 0.17^a	17.06 ± 0.30	8.11 ± 0.26	17.24 ± 0.17	6.58 ± 0.11	1.29 ± 0.07	3.96 ±0.05^a

^{a,b,c,d}*Means in the same column with no common superscript differ significantly (P≤0.05)*

The group T_7 followed by T_{10}, T_9 and T_6 recorded the highest breast yield with no significant (P>0.05) difference between them, whereas they were significantly different from other treatments. The yield of thigh (%) in group T_1, T_2, T_3, T_4, T_5, T_6, T_7, T_8, T_9 and T_{10} were 14.31, 14.18, 14.32, 14.30, 14.22, 15.74, 15.85, 14.61, 15.92 and 16.10, respectively. Statistical analysis revealed a significant (P≤0.05) difference in yield of thigh between the treatments. The group T_{10} followed by T_9, T_7 and T_6 recorded the highest yield of thigh with no significant (P>0.05) difference between them, whereas they were significantly different from other treatments. The drumstick yield (%) in group T_1, T_2, T_3, T_4, T_5, T_6, T_7, T_8, T_9 and T_{10} were 16.97, 16.66, 17.00, 16.99, 16.95, 17.05, 17.09, 16.93, 17.06 and 17.06, respectively. The yield of wing (%) were 8.03, 8.04, 8.08, 8.09, 8.02, 8.02, 8.06, 7.93, 8.04 and 8.11, respectively in different treatments. The yield of back (%) were 17.46, 17.49, 17.52, 17.55, 17.47, 17.07, 17.17, 17.53, 17.16 and 17.24, the yield of neck (%) were 6.45, 6.42, 6.42, 6.37, 6.40, 6.53, 6.48, 6.62, 6.56 and 6.58 and that of abdominal fat (%) were 1.42, 1.39, 1.47, 1.40, 1.49, 1.41, 1.33, 1.37, 1.34 and 1.29, respectively in group T_1, T_2, T_3, T_4, T_5, T_6, T_7, T_8, T_9 and T_{10} on 42nd day. ANOVA revealed no significant (P>0.05) difference in yield of drumstick, wing, back, neck and abdominal fat at 42ndday of the experiment between the treatments. The meat: bone ratio in group T_1, T_2, T_3, T_4, T_5, T_6, T_7, T_8, T_9 and T_{10} were 2.78, 2.80, 2.84, 2.88, 2.84, 3.71, 3.80, 2.86, 3.87 and 3.96, respectively. Statistical analysis revealed a significant (P≤0.05) difference in meat: bone ratio between the treatments. The group T_{10} recorded the highest ratio followed by groups T_9, T_7 and T_6. No significant (P>0.05) difference in meat: bone ratio was observed between groups T_1 to T_5, whereas significant difference existed between the above mentioned groups with groups T_6, T_7, T_9 and T_{10}.

At the end of 42nd day, results revealed a significant (P≤0.05) difference in dressing percentage, breast yield (%), thigh yield (%) and meat: bone ratio, whereas no significant (P>0.05) difference was observed with respect to yield of drumstick (%), wing yield (%), back yield (%), yield of neck (%) and abdominal fat (%) between the treatments. It was evident that significantly higher dressing percentage, breast yield (%), thigh

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yield (%) ratio was observed in birds fed 2 per cent (T_6 and T_9) and 3 per cent (T_7 and T_{10}) YEN up to 28 days and 42 days as compared to control (T_1), 1, 2 and 3 per cent (T_2, T_3 and T_4) YEN up to 14 days and 1 per cent (T_5 and T_8) YEN fed up to 28 days and 42 days. Higher meat: bone ratio was observed in birds fed 2 per cent (T_9) and 3 per cent (T_{10}) YEN fed up to 42 days followed by birds fed 2 per cent (T_6) and 3 per cent (T_7) YEN up to 28 days compared to control and other treatments. The results clearly indicated that feeding graded levels of YEN at different interval did not significantly (P>0.05) influence yield of drumstick (%), wing yield (%), back yield (%), yield of neck (%) and abdominal fat (%) in birds fed 1, 2 and 3 per cent (T_6, T_7, T_8, T_9 and T_{10}) YEN up to 28 and 42 days, control (T_1), different levels of YEN (1, 2 and 3 %) up to 14 days.

The results of the present study were in agreement with the findings of Fathi *et al.* (2012) who observed that the inclusion of yeast in commercial broilers slightly improved carcass percentage and thigh percentage. They also opined that the birds fed diets containing yeast @ 1.5g/kg had significantly (P≤0.05) higher percentage of major and minor breast muscles compared with others that fed basal diet. Similar results were also reported by Marina *et al.* (2006) in Japanese quails (*Coturnix coturnix japonica*) who observed that feeding of yeast derivatives up to 35 days of age resulted in significantly higher carcass weight, carcass yield, wing weight and drumstick weight as compared to that of control.

Conclusion

Based on the results of the present study it was concluded that feeding of 2 and 3 per cent YEN up to 28 and 42 days resulted in similar improvement on major carcass characteristics, indicating that feeding 2 per cent YEN up to 28 days would result in optimal results in improvement of carcass traits and better economy in commercial broiler production.

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