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Effects of graded level of nucleotide rich yeast extract supplementation in diets on growth performance and economics of broilers

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Abstract
One hundred and twenty (n=120), day old broiler chicks (Vencobb-430) were divided into four groups; one control and three treatment groups with three replicates of ten chicks in each and reared for a period of thirty five days. Four experimental diets were prepared (BIS 2007), T1 supplemented basal diet, T2 basal diet + 0.5% (500 gm NuPro® / 100 kg of feed), T3 basal diet + 1.0% (1000 gm NuPro® / 100 kg of feed)) and T4 basal diet+ 1.5% (1500 gm NuPro® / 100 kg of feed) of dietary nucleotide rich yeast extract. The treatment means of live body weight, cumulative weight gain and feed consumption of birds from groups T2, T3 and T4 receiving diet containing 0.5%, 1% and 1.5% dietary nucleotide rich yeast extract, respectively were significantly ($P<0.05$) higher than control group T1. However, the birds from treatment group T2 receiving diet with 0.5% dietary nucleotide rich yeast extract was recorded significantly ($P<0.05$) highest means of live body weights and cumulative weight gain as compared to all other treatment groups. The feed conversion ratio was significantly ($P<0.05$) better in treatment groups T2, T3 and T4 compared than control group T1. The highest net profit (Rs,/kg) was recorded in treatment group T2 receiving diet containing 0.5% dietary nucleotide rich yeast extract followed by treatment groups T3, T4 and T1. Thus, it is concluded that incorporation of dietary nucleotide rich yeast extract at 0.5% level in broiler diet improves growth performance in terms of live body weight, gain in weight, feed intake and feed conversion ratio which increased profitability in broiler production.

Keywords: Nucleotide rich yeast extract, growth performance, economics, broilers.

Introduction
Nucleotides (NT) have essential physiological and biochemical functions including encoding and deciphering genetic information, mediating energy metabolism and cell signaling as well as serving as components of coenzymes, allosteric effectors and cellular ago-nists in terrestrial animals [1]. Because of active *de novo* synthesis of NT mainly in liver, most animal appear to be almost independent on exogenous NT [2]. However, the requirements for exogenous NT may increase under certain conditions, e.g. tissue injury, dysfunction of liver, under disease or stress, or in fast-growth life stage. The researcher [3] have studied effect of Dietary Yeast (*Saccharomyces cerevisiae*) supplementation on performance, carcass characteristics and some metabolic responses of broilers and concluded that yeast can be included in broiler diet at 1% without detrimental effects on performance and therefore, could serve as a natural substitute for antibiotics. The addition of yeast extract to broiler diets improves weight gain and feed conversion ratio [4]. Although, like mammals, poultry can synthesize nucleotides *de novo*, it is currently thought that the capacity for nucleotide production, especially in young animals, may not be enough to meet demand. Because of this, nucleotides have been described as being conditionally essential, and will be most beneficial under periods of stress, such as during disease and health challenges, high stocking densities, periods of rapid growth and antibiotic replacement or removal. In order to prevent performance losses in poultry production, several natural alternatives to AGPs have been studied. Thus, nucleotides may be one of these alternatives. The beneficial effect of nucleotides on intestinal cell integrity, development, and turnover, with significant proliferation of crypt cell was already demonstrated [5]. The nucleotides also increase intestinal villi length and improve the immune response of broilers, promoting nutrient absorption and increased weight gain [6]. They have also significant effects on enterocytes during intestinal development, maturation, and repair after damage caused by stress or pathogens [7].

In view of the above facts, the present experiment was conducted to study the effects of graded level of nucleotide rich yeast extract supplementation in diet on growth performance and economics of broilers.

2. Materials and Methods
2.1 Experimental design
One hundred and twenty day old broiler chicks (Vencobb-430) were purchased from private hatchery. The experiment was conducted for the period of five weeks. The chicks were equally and randomly distributed into four treatment groups. Each treatment groups were further divided in to three replicates with ten chicks in each. The treatment group T1 supplemented basal diet as control group, T2 basal diet + 0.5% (500 gm NuPro® / 100 kg of feed), T3 basal diet + 1.0% (1000 gm NuPro® / 100 kg of feed)) and T4 basal diet+ 1.5% (1500 gm NuPro® / 100 kg of feed) of dietary nucleotide rich yeast extract. The four experimental diets were prepared as per BIS 2007 [8]. The ingredients and nutrient composition of control group T1 has been presented in Table 1. Before arrival of the broiler chicks (Cobb-430) the waters, the pens, brooders, feeder and floor were cleaned, washed and disinfected. The room where experiment was being conducted was painted with limestone. All the chicks were housed on deep litter with paddy husk as a litter material and all the groups were provided similar environmental and managemental condition throughout experimental period. Artificial heat was provided to chicks during the early period of growth using electric bulbs. The birds were vaccinated with standard vaccination schedule recommended for Vencobb-430. All experimental diets was iso-caloric and iso-nitrogenous in nature.

Table 1: Percent Ingredient (%) and nutrient composition of basal diet for pre-starter, starter and finisher rations

Feed Ingredients (%)	Pre-Starter	Starter	Finisher
Maize	53.2	54.0	58.5
Soybean meal	41.0	39.0	33.8
Vegetable oil	3.0	4.2	4.9
Di-Calcium phosphate	1.5	1.5	1.5
Limestone powder	1.0	1.0	1.0
Salt	0.3	0.3	0.3
Total	100	100	100
Protein	23.05	22.02	20.05
Metabolizable energy (Kcal/kg)	3011.16	3100	3202.22
Energy:Protein ratio	130.63:1	140.78:1	159.71:1
Supplements/additives(g/100kg)			
*Mineral mixture	300	300	300
** Vitamin mixture	150	150	150
DL-Methionine	180	190	160
L-Lysine	170	130	100
Choline chloride	60	60	60
Dietary nucleotide rich yeast extract	#	#	#

Dietary nucleotide rich yeast extract was incorporated in the treatment groups as described in treatment detail.
*Each kg of trace mineral premix contains: Cu - 15 g; Co - 02 g; Fe - 60 g; Zn - 80 g; Mn - 80 g; I - 02 g; Se - 0.3 g.
**Each kg of vitamin premix contains: Vitamin A - 80 MIU; vitamin D3 - 12 MIU; vitamin E - 70 g; vitamin K3 - 8 g; vitamin B1 - 6.4 g; vitamin B2 - 40 g; vitamin B6 - 12.8 g; vitamin B12 - 160 mg; Nicotinic acid - 80 g; Folic acid - 4 g; Biotin - 24 mg.

2.2 Parameters studied and Statistical Analysis
Birds from each group were weighed individually on day 0 and at weekly intervals. The effect of dietary nucleotide supplementation rich yeast extract on body weight, weight gain, feed intake and FCR was calculated. The feed cost per kg body weight gain in broilers reared under different treatment regimen of the present study was calculated based on feed consumption during the 0-35 day's period. The differences among treatments within experiment were analyzed by using completely randomized design [9]. The treatment means were compared by critical differences and Analysis of Variance.

3. Results and Discussion
The body weight (BW), body weight gain (BWG), feed intake (FI) and feed conversion ratio (FCR)in broilers with dietary supplementation of nucleotide rich yeast extract for up to 5th week of age have been presented in Table 2.

3.1 Live body weight and weight gain
The day-old live weights of the chicks for treatment groups T1 to T4 were 44.6±0.30, 44.6±0.26, 44.0±0.12 and 44.5±0.39 g/bird, respectively. The means of live body weight and cumulative weight gain of birds from groups T2, T3 and T4 receiving diet containing 0.5%, 1% and 1.5% dietary nucleotide rich yeast extract, respectively were significantly (P<0.05) higher than control group T1. However, the birds from treatment group T2 receiving diet with 0.5% dietary nucleotide rich yeast extract was recorded significantly (P<0.05) highest means of live body weights and cumulative weight gain as compared to all other treatment groups. The findings were agreement with researchers reported that broilers fed 0.5 and 1.0g yeast had improved daily weight gain and final live weight probably as a carryover effect from the starter phase [10]. However, the birds supplemented with 0.2% yeast had significantly (P<0.01) highest body weight in broilers [11]. Similarly, the effect of *Sacchromyces cerevesiae* as a dietary probiotic was reported that broilers fed a higher dosage (>1.0%) of SC diets gave higher (P<0.01) body weight [12].

3.2 Feed Consumption
The feed consumption means of treatment groups T2, T3 and T4 receiving diet containing 0.5%, 1% and 1.5% dietary nucleotide rich yeast extract, respectively were significantly (P<0.05) higher than control group. Whereas, treatment group T2 recorded significantly (P<0.05) higher feed intake than all other treatment groups. Similarly, the study revealed that significantly higher feed intake (P<0.05) were recorded in treatment group (baker yeast 1.5%) and treatment group (baker yeast 2%) than control [13]. However, the cumulative feed intake was significantly higher (P<0.05) in nucleotide supplemented group up to 8th week period in ducklings [14].

Table 2: Effect of dietary supplementation of nucleotide rich yeast extract on different growth parameters in broilers up to 5th week of age

Live Body weights (g/bird)							
Treatment Groups	**I week**	**II week**	**III week**	**IV week**	**V week**	**Pooled means**	**CD**
T1	151.40 ±4.43	368.67 ±5.98	717.38 ±16.68	1161.33 ±15.49	1693.76 ±19.47	689.52 ±141.50^{c}	13.74*
T2	149.50 ±1.76	401.67 ±5.94	789.29 ±3.54	1282.53 ±6.25	1870.50 ±30.47	756.36 ±157.24^{a}	
T3	149.97 ±1.95	390.87 ±16.08	759.60 ±16.10	1233.33 ±5.67	1800.22 ±11.22	729.68 ±150.91^{b}	
T4	152.37 ±1.39	397.73 ±4.13	729.33 ±7.94	1211.43 ±15.24	1771.23 ±18.54	717.78 ± 147.87^{b}	
Cumulative weight gain (g/bird)							
T1	106.80 ±4.74	324.07 ±6.28	672.78 ±16.97	1116.73 ±15.54	1649.16 ±19.23	773.91 ±148.47^{c}	16.50
T2	104.84 ±1.56	357.01 ±5.77	744.63 ±3.39	1237.87 ±6.01	1825.84 ±30.44	854.04 ±165.36^{a}	
T3	105.87 ±2.01	346.77 ±16.20	715.50 ±16.14	1189.24 ±5.79	1756.13 ±11.10	822.70 ±158.51^{b}	
T4	107.81 ±1.06	353.17 ±3.74	684.77 ±10.66	1166.87 ±14.87	1726.67 ±18.15	807.86 ±155.22^{b}	
Cumulative feed consumption (g/bird)							
T1	133.73 ±8.44	428.37 ±7.84	964.57±13.21	1657.50 ±19.16	2575.28 ±41.64	1151.89 ±235.48^{c}	22.17*
T2	123.17 ±3.81	456.75±3.18	1026.82 ±17.71	1767.11 ±21.07	2752.19 ±27.41	1225.21 ±252.78^{a}	
T3	127.10 ±2.63	450.52 ±14.04	997.29 ±11.88	1718.88 ±11.31	2676.24 ±29.10	1194.01 ±245.09^{b}	
T4	128.70 ±2.10	458.40 ±4.89	955.23 ±13.29	1694.71 ±15.17	2646.32 ±18.00	1176.67 ±241.81^{b}	
Cumulative feed Conversion ratio							
T1	1.25±0.03	1.32±0.01	1.43±0.02	1.48±0.01	1.56±0.01	1.41±0.03^{a}	0.02*
T2	1.17±0.03	1.28±0.02	1.38±0.02	1.43±0.01	1.51±0.01	1.35±0.03^{b}	
T3	1.20±0.01	1.30±0.02	1.39±0.02	1.45±0.02	1.52±0.01	1.37±0.03^{b}	
T4	1.19±0.01	1.30±0.004	1.40±0.01	1.45±0.01	1.53±0.01	1.37±0.03^{b}	

Means bearing different superscripts within a column differ significantly. *$P<0.05$, CD-Critical difference.

3.3 Feed conversion ratio
The significantly ($P<0.05$) better FCR was recorded in treatment groups T2, T3 and T4 as compared to control group T1. The best FCR was reported in treatment group T2 receiving diet containing 0.5% dietary nucleotide rich yeast extract than other treatment groups. The results are in accordance with researchers who investigated that the effect of diets formulated with Rubber Seed Meal (RSM) (*Heve abrasiliensis*) and *Saccharomyces* yeast broiler chicks and found improved feed conversion ratio (FCR) in group T1 (RSM+yeast) [15]. Similarly, the broiler chickens with inclusion of yeast-derived products improved feed conversion ratio at both 21 and 28 day of age compared to the control group [16].

3.4 Economics
The net economics of broiler production up to 5th week of age have been presented in Table 3. The highest net profit (Rs,/kg) was recorded in treatment group T2 receiving diet containing 0.5% dietary nucleotide rich yeast extract followed by treatment groups T3, T4 and T1. However, the cost of production (Rs./kg) was lowest in treatment group T2 as compared to all other treatment groups. Similarly, the researchers Manal and Abou [17] as well as Hosseinni [18] found economic efficiency at 0.5% and 0.2% yeast, respectively.

Table 3: Economics of broiler production in different dietary treatment groups

S. No.	Particulars	T1 (Control)	T2	T3	T4
1.	Total feed intake (g/bird)	2575.28	2752.19	2676.24	2646.32
2.	Total feed cost (Rs./bird)	71.28	76.93	75.58	75.47
3.	Cost of production (Rs./bird)	115.28	120.93	119.58	119.47
4.	Cost of production (Rs./ kg live wt.)	71.02	67.53	69.33	70.40
5.	Average body weight at the end of 5th week (g/bird)	1693.76	1870.5	1800.22	1771.23
6.	Total Return (Rs/bird)	127.03	140.28	135.01	132.84
7.	Net profit (Rs./bird)	11.76	19.35	15.44	13.37
8.	Net profit (Rs./kg)	3.98	7.47	5.67	4.60

4. Conclusion
Thus, it is concluded that incorporation of dietary nucleotide rich yeast extract at 0.5% level in broiler diet improves growth performance in terms of live body weight, gain in weight, feed intake and feed conversion ratio which increased profitability in broiler production.

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