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Effect of nucleotide on performance and slaughter traits in broiler chicks

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Health of the gut is the major contributor that govern the birds performance and economics of poultry sector. Antibiotic growth promoter, prebiotic, probiotic, symbiotic arose as some new approaches to be used for this purpose. But antibiotic growth promoters (AGP) in animal diet have been banned in several countries due to the public health concern with the development of resistant bacteria. In this context, nucleotides have been the latest addition as intestinal modulators. In chickens, the gastrointestinal tract has rapid cell turnover and is unable to produce de novo the required amount of nucleotides to satisfy their own requirement (Leleiko *et al*. 1983).The goal of the present study is indicating the effects of nucleotide on growth performance values and slaughter traits in Ven Cobb broiler chicks.

Experimental design and housing: Day-old Ven Cobb broiler chicks (200), belonging to single hatch were wing banded, weighed and were randomly assigned in 5 treatment groups of 40 chicks in each (4 replicates of 10 birds / treatment). The trial lasted 42 days. Birds were raised under deep liter system. Broiler starter, grower and finisher rations were offered to the birds in mash form. Weighed amount of each test diet was offered daily to chicks to ensure *ad lib.* feeding. Fresh and clean drinking water was always made available in suitable trough to the birds during study. Artificial light was provided during night hours to extend 24 h photoperiod. The brooding temperature was maintained close to the requirement. Vaccination of birds was done time to time. The experimental design was a completely randomized design (CRD).

Treatments and additives: Ingredient and nutrient composition of diets for chicks at 0 to 42 days old were based on the National Research Council (NRC 1994) recommendations (Table 1, 2). Treatment groups were: diet T_1 control (without nucleotide), diets T_2, T_3, T_4 and T_5 were control plus nucleotide @ 0.08% of diet for 7, 14, 28 and 42 days, respectively.

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Table 1. Ingredient composition of starter, grower and finisher's broiler diet (on % DM basis)

Feed ingredients	Starter	Grower	Finisher
Yellow maize	58.5	61.44	67.92
Soya DOC	35.74	30.02	22.63
Deoiled rice bran	0.12	-	-
Meat-cum-bone meal	-	3.5	5
Maize gluten	-	-	0.3
Soyabean oil	1	1.89	2.2
Dicalcium phosphate	2.18	1.35	1.05
Limestone powder	0.94	0.43	0.21
DL-methionine (Alimet)	0.34	0.27	0.23
Lysine	0.08	0.05	0.11
Soda-bi-carb	0.11	0.04	0.05
Choline chloride	0.07	0.05	0.03
Salt	0.33	0.31	0.26
Premix*	0.49	0.41	0.39

* Trace mineral premix mg/kg diet: Mg 300, Mn 55, Fe 56, Zn 30, Cu 4; vitamin premix per kg diet: vit. A 8250IU, vit. K 1mg, vit. E 26.84 mg, vit. B_1 2 mg, vit. B_2 4 mg, vit. B_{12} 100 mg, Niacin 60 mg, pantothenic acid 10 mg; choline 500 mg and 30 ppm salinomycin (coxistac 12%), 55 ppm bacitracin methylene di salicyclate (BMD11 0,)

Measurements: Feed intake and body weight was measured and then feed conversion ratio (FCR) was calculated weekly. A metabolism trial of 3-day collection period was conducted between 40 and 42 day, during which feed consumed by each replicate in the respective dietary group was recorded and the droppings voided over the same period were collected quantitatively. The dried and pooled feed samples, residues and faecal materials were ground and stored in air tight containers for nitrogen (AOAC 1995), Ca (Talapatra *et al*. 1940) and P (Fiske and Subba Rao 1925) estimation. At 42 day of age, 3 birds of identical body weight from each replicate were sacrificed. The birds were fasted overnight, bled, defeathered and eviscerated with sufficient care. Different carcass parameters like defeathered weight, eviscerated weight, and weight of liver, heart and gizzard were recorded. Each of carcass components such as breast, legs, wings and back with neck was recorded and presented as a percentage of live body weight.

Statistical analysis: The data obtained were subjected

Table 2. Chemical composition of starter, grower and finisher's broiler diet (on % DM basis)

Diet	Moisture (%)	CP (%)	CF (%)	EE (%)	ME (kcal/kg)	Total ash (%)	AIA (%)	NFE (%)	Ca (%)	P (%)
Starter (0–14 days)										
T_1	10.2	22.95	3.77	5.43	2903	8.15	1.45	59.7	0.92	0.65
T_2	10.21	22.92	3.76	5.39	2902	6.54	1.05	61.39	0.92	0.63
T_3	10.21	22.92	3.76	5.39	2902	6.54	1.05	61.39	0.92	0.63
T_4	10.21	22.92	3.76	5.39	2902	6.54	1.05	61.39	0.92	0.63
T_5	10.21	22.92	3.76	5.39	2902	6.54	1.05	61.39	0.92	0.63
Grower(14–28 days)										
T_1	9.2	21.46	3.44	7.49	3001	7.24	1.28	60.37	0.86	0.65
T_2	9.2	21.46	3.44	7.49	3001	7.24	1.28	60.37	0.86	0.65
T_3	9.2	21.46	3.44	7.49	3001	7.24	1.28	60.37	0.86	0.65
T_4	9.28	21.42	3.42	7.42	3004	8.94	1.61	58.8	0.86	0.66
T_5	9.28	21.42	3.42	7.42	3004	8.94	1.61	58.8	0.86	0.66
Finisher (28–42 days)										
T_1	10.7	19.76	3.27	8.53	3102	7.39	1.38	61.05	0.94	0.72
T_2	10.7	19.76	3.27	8.53	3102	7.39	1.38	61.05	0.94	0.72
T_3	10.7	19.76	3.27	8.53	3102	7.39	1.38	61.05	0.94	0.72
T_4	10.7	19.76	3.27	8.53	3102	7.39	1.38	61.05	0.94	0.72
T_5	10.75	19.76	3.28	8.5	3103	8.1	1.46	60.36	0.92	0.65

Table 3. Effect of supplementation of nucleotide on performance of broiler chicks at 42 days

Particulars	T_1	T_2	T_3	T_4	T_5	Overall mean
Body weight (g)	2117.15±2.34[a]	2264.63±2.13[b]	2309.74±31.21[c]	2353.12±1.29[d]	2232.46±1.90[b]	2255.42±19.25
Feed intake (g/day)	3701.86±8.54[a]	3695.38±5.57[a]	3812.08±5.50[c]	3896.50±2.59[d]	3763.80±5.01[b]	3773.92±17.31
FCR (feed/gain)	1.79±0.00[e]	1.67±0.00[b]	1.66±0.00[a]	1.70±0.00[c]	1.73±0.00[d]	1.71±0.02

Superscripts are read row-wise for comparison of means. Means in the same row with different superscript a, b, c, d, e are significantly different.

Table 4. Average intake, excretion and balances of nitrogen, calcium and phosphorus in broilers fed on different experimental diets

Particulars	T_1	T_2 (7d)	T_3 (14d)	T_4 (28d)	T_5 (42d)	Overall mean
Nitrogen (g/day)						
Intake	3.41±0.00[a]	3.42±0.00[b]	3.44±0.00[c]	3.46±0.00[d]	3.50±0.00[e]	3.44±0.01
Excreted	0.77±0.00	0.77±0.00	0.77±0.00	0.77±0.00	0.78±0.01	0.77±0.00
Retained	2.64±0.00[a]	2.65±0.00[a]	2.67±0.00[b]	2.69±0.00[c]	2.73±0.01[d]	2.68±0.01
Retention %	77.51±0.00	77.54±0.00	77.56±0.00	77.65±0.00	77.77±0.24	77.60±0.05
Calcium (g/day)						
Intake	0.87±0.09	1.12±0.08	0.91±0.09	0.84±0.08	0.56±0.21	0.86±0.06
Excreted	0.43±0.09	0.67±0.08	0.45±0.09	0.38±0.08	0.26±0.10	0.44±0.05
Retained	0.44±0.00	0.45±.00	0.45±0.00	0.45±0.00	0.30±0.11	0.42±0.02
Retention %	52.93±6.69	41.09±3.56	51.46±4.35	56.07±6.07	54.56±2.08	51.22±2.28
Phosphorus (g/day)						
Intake	0.67±0.07	0.86±0.07	0.69±0.07	0.64±0.06	0.44±0.16	0.66±0.11
Excreted	0.41±0.04	0.53±0.04	0.42±0.04	0.39±0.04	0.27±0.10	0.40±0.03
Retained	0.26±.03	0.33±0.03	0.27±0.03	0.25±0.03	0.17±0.07	0.26±0.02
Retention %	38.67±0.03	38.84±0.02	38.86±0.01	39.08±0.01	39.08±0.28	39.08±0.06

Superscripts are read row-wise for comparison of means. Means in the same row with different superscript a, b, c, d, e are significantly different.

to statistical analysis by the software SPSS 10 (SPSS 1997). Levels of significance were calculated as per the standard method (Duncan 1995) whenever any effect was found significant.

Studies showed some favourable responses for body weight, FCR and carcass yield by dietary additives. In the present study, body weight of nucleotide supplemented group was significantly ($P<0.05$) higher than control and being highest in T_4 (2353.12 g) (Table 3). Feed intake of birds fed nucleotide was higher than control group. Birds fed nucleotide have improved FCR as compared to control group ($P<0.05$) and was recorded best in T_3 (1.66). The

Table 5. Effect of nucleotide on various carcass cuts of broiler chicken as percentage of live weight at 42 day

Particulars	T_1	T_2 (7d)	T_3 (14d)	T_4 (28d)	T_5 (42d)	Overall mean
Dressing %	64.31±0.16[a]	65.84±0.53[b]	65.79±0.44[b]	67.69±0.40[c]	67.54±0.67[c]	66.23±0.34
Liver	1.98±0.08[a]	2.23±0.04[b]	2.13±0.03[ab]	2.38±0.12[c]	2.13±0.02[ab]	2.17±0.04
Heart	0.52±0.03	0.56±0.00	0.58±0.00	0.59±0.02	0.66±0.06	0.58±0.02
Gizzard	1.95±0.27	2.09±0.09	2.14±.06	2.27±0.10	2.02±0.13	2.09±0.06
Proventriculus	0.53±0.02[b]	0.45±0.03[a]	0.42±0.03[a]	0.52±0.02[b]	0.54±0.05[b]	0.49±0.02
Intestine	6.93±0.42[b]	5.85±0.16[a]	5.73±.08[a]	5.12±0.20[a]	5.14±0.12[a]	5.75±0.18[a]
Breast	8.99±0.22[b]	9.16±0.28[b]	9.85±0.05[b]	7.22±0.59[a]	9.22±0.82[b]	8.89±0.28
Thigh	19.53±0.70	20.47±0.03	20.17±0.31	18.86±0.12	20.06±0.53	19.82±0.21
Wing	17.32±0.16[b]	15.95±0.18[a]	16.18±0.24[a]	20.38±0.62[c]	18.13±1.07[b]	17.59±0.43
Back and neck	15.23±0.49	15.73±0.71	15.01±041	16.21±0.39	15.12±0.08	15.46±0.21
Giblet	4.45±0.38	4.88±0.14	4.84±0.08	5.51±0.26	4.82±0.19	4.90±0.12

Superscripts are read row-wise for comparison of means. Means in the same row with different superscript a, b, c, d, e are significantly different.

present findings are in agreement with others (Rutz *et al.* 2007, Saravanan *et al*. 2010). Findings of the current study were not in consistent with Zauk *et al*. (2006), Owens *et al*. (2007), Zavarize *et al*. (2007) and Pelicia *et al*. (2010) who did not observe any significant difference in feed intake and weight gain. In contrast, study conducted at Catholic University of Ecuador indicated a significant increase in weight gain and feed efficiency by inclusion of 1.5 % NuPro in prestarter diet. The findings are also supported by Tipa *et al.* (2000), Shivkumar *et al*. (2008) in broilers and Takeda and Takii (1992) in Japanese eel.

Widmaier *et al*. (2004) stated that posthatch muscular development occurs due to muscle fibre hypertrophy because, cardiac rRNA is synthesized @15 % per day (Ray *et al*. 1973). Nutrient availability posthatch is dependent on sound intestinal health as it is the first site to get exposed to nutrients and are metabolized and absorbed via various intestinal enzymes. Intestinal development (villi height, crypts, enterocytes) and development of enzymes in intestinal brush border is highly dependent on dietary nucleotides (Uauy *et al*. 1990).

Balance study showed no significant difference among the groups in respect to the intake, outgo and balances of Ca and P and significant (P<0.05) difference in N intake and retention, being highest in T_5 (Table 4). Highest dressing percentage was recorded in T_4 (67.69 %). Liver and wing were also recorded highest in T_4 while highest breast weight was recorded in T_3. No significant difference was noticed in weight of heart, gizzard, proventriculus, wing, back and neck and giblet percentage in between treatment and control. Per cent intestinal weight drastically reduced in nucleotide supplemented groups as compared to control (Table 5). The current findings were not in accordance with the findings of others (Shivkumar *et al.* 2007, Pelicia *et al*. 2010). Results were similar for higher spleen weight, higher breast weight and no effect on thigh, drumstick and wings. But lower intestinal weight was supported by Carver (1994*)* who reported small bowel wt./length ratio. The significant increase in weight of liver in the present study can be explained with fact as endogenous supply of nucleotides, mainly in the liver (Mayer *et al*. 1990) appears to be inadequate to meet nucleotide requirements under rapid tissue growth and is highly dependent on dietary pyrimidines (Berthhold *et al*. 1995).

It can be concluded that dietary supplementation of nucleotide improve performance and carcass traits of broiler chicks.

SUMMARY

The present study was conducted to evaluate the influence of nucleotide on performance values and slaughter traits in broiler chicks. The experimental diets consisted of T_1 control (without nucleotide), diets T_2, T_3, T_4 and T_5 were control plus nucleotide @ 0.08% of diet for 7, 14, 28 and 42 days, respectively. Birds fed nucleotide showed significant elevation in body weight as compared to control and being highest in T_4. Feed intake of birds fed nucleotide was higher than control group. Birds fed nucleotide have improved FCR in comparison with control and was recorded best in T_3. No significant difference was obtained among the groups in Ca and P balance, however, a significant increase in N intake and balance was recorded in T_5 as compared to other groups. Dressing percentage significantly increased in nucleotide supplemented groups as compared to control and being highest in T_4. No significant difference was noticed in heart, gizzard, proventriculus, wing, back and neck and giblet percentage between treatment and control. Per cent intestinal weight drastically reduced in all treatment groups as compared to control. Results indicated that nucleotide has positive effects on performance and slaughter traits in broiler chicks.

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