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Effect of feed additives on nutrient utilization and economics of feeding in broiler chicken

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Abstract
The study was carried out with two hundred numbers of day old Anak-2000 broiler chicks and were divided into four groups of 50 chicks each. Group I was kept as control, group II was fed with antibiotic STAFAC 20 at the rate of 50g/100 kg of feed, group III was fed with Probiotic BIOVET YC at the rate of 50g/100 kg of feed and group IV was fed with a a a combination of antibiotic STAFAC 20 and Probiotic BIOVET YC at the rate of 25g each/100 kg of feed. It was observed that the digestibility co-efficient of dry matter was slightly higher in all the growth promoter supplemented group than that of the control group. The digestibility co-efficient of protein were slightly higher in group II and III than that of the control group. The digestibility co-efficient of ether extract and crude fibre also showed a non significant higher values in group II., III and IV than group I. The percentage of retention of nitrogen, calcium and phosphorus were almost similar in all the groups though the treated groups showed a non significant increase. From the economics of feeding the birds, the cost of feeding per kg weight gain was highest in control group compared to other groups. Thus, it can be concluded that the nutrient utilization in birds treated with growth promoters was better in comparison to the control birds and the cost of feeding per kg weight gain was cheaper in the treated groups than the control group though not significant.

Keywords: Antibiotic, Probiotic, Broiler Birds, Nutrient utilization, Feed economics

1. Introduction
The biggest challenge of commercial poultry production is the availability of good quality feed on sustainable basis at stable prices. The efficiency of poultry to convert the feed into meat plays a key role in economics of broiler industry. In spite of all the encouraging information on profitable poultry farming a major drawback has been the expenditure involved towards meeting the feed cost. The feed cost can efficiently be minimized along with achieving the productivity and efficiency of feed utilization by utilizing various feed additives like antibiotics, probiotics, enzymes, antifungals etc. It seems that without addition of these additives full benefit of the nutrients present in the diet may not be obtained. It has been suggested that feed additives may be more efficient when low nutrient diets are fed. Generally, low density diets are more profitable and resulted in less environmental pollution problems. In recent years, the high price of protein sources as well as environmental concerns related to high nitrogen excretion have resulted in increasing interest for using low protein diets in poultry production [1]. Considering the positive effects of antibiotics and probiotics on nutrient utilization, the present work was taken up to assess the effect of antibiotic, probiotic and their combination on nutrient utilization and cost of feeding per kg live weight gain in broiler birds in the agro-climatic condition of Assam.

2. Materials and methods
2.1 Birds and dietary treatments- Two hundred numbers of day old Anak-2000 broiler chicks of uniform body weight were used in a Randomized Block Design (RBD) and divided into four groups of 50 chicks each. Each group had two replicates of twenty five chicks each. A basal diet (Table 1) was formulated and considered as control. The feeding trial was performed for a period of 6 weeks and starter diet were fed ad libitum up to 28 days of age followed by finisher diet. Group I was kept as control, group II was fed with antibiotic STAFAC*20, a commercial growth promoter at the rate of 50g/100 kg of feed, group III was fed with Probiotic BIOVET*YC, a commercial growth promoter at the rate of 50g/100 kg of feed and group IV was fed with a combination of antibiotic STAFAC*20 and Probiotic BIOVET*YC at the rate of 25g each/100 kg of feed.

Table 1: Percentage ingredient composition of basal diet of broiler birds

Ingredients	Broilefr Starter	Broiler Finisher
Maize	54.0	60.0
Rice polish	10.0	12.0
Ground nut cake	13.0	10.0
Soyabean meal	9.0	12.0
Fish meal	7.0	4.0
Meat & bone meal	5.0	-
Mineral mixture	1.5	-
Salt	0.5	0.5

*Vitamin Premix (Hyblend vit.AB_2D_3k) was added @ 25 g/100 kg of diet in both starter and finisher ration

2.2. Management of the experimental birds: The chicks were reared on freshly laid deep liter in a well-ventilated shed. The shed was thoroughly cleaned and disinfected prior to housing of the chicks. The chicks were reared under electric brooders up to 4th weeks of age maintaining a temperature between 95º and 100º F. They were wing banded for individual identification. The racking of the deep litter was done periodically to avoid spoilage of the litter.

2.3. Feeding of the experimental bird: From day one to the end of the trial, birds were fed ad libitum in 3 divided doses at 7.30 am, 11.30 am and 3.30 pm. Data on the quantity of feed offered and residue left were recorded each day. The total excreta voided in 24 hours from each bird was collected and weighed.

2.4. Analytical Procedure: A proximate analysis of experimental diet and faeces were done by those methods recommended by AOAC [2]. It was done on the representative samples of diet and faeces to determine the dry matter, crude protein, crude fibre and ether extract. Calcium, phosphorus and nitrogen were estimated by the modified method [3]. The data were statistically analyzed according to the standard procedure [4].

2.5. Economics of feeding: The average cost of feeding per unit of weight gain in different experimental groups were calculated from the amount of feed consumed per kg body weight gain multiplied by the cost of per kg experimental diet. Cost of feeding per kg body weight gain (Rs)=Amount of feed consumed per kg body weight gain X cost of per kg diet (Rs)

3. Results and discussion

3.1 Digestibility co-efficient of various organic nutrients in broiler birds: The intake and digestibility co-efficient of dry matter, protein, ether extract and crude fibre has been presented in table 2. The digestibility co-efficient of dry matter of group I, II, III and IV were 68.40%, 68.83%, 68.79% and 68.84% respectively. It was observed that the digestibility co-efficient were slightly higher in the entire growth promoter supplemented group than that of the control group. The digestibility co-efficient of protein of group I, II, III and IV were 60.57 %, 61.11 %, 60.92% and 61.06% respectively. The digestibility co-efficient of protein were slightly higher in group II and III than that of the control group. The supplementation with probiotic tended to increase the digestibility of crude protein [5-6]. The higher CP digestibility in the present study might be due to the effect of growth promoter. The digestibility co-efficient of ether extract of group I, II, III and IV were 63.87%, 65.64%, 67.09% and 67.82% respectively. The supplementation of probiotic in broiler diet significantly (P>0.01) increase the digestibility of crude fat [5]. The digestibility co-efficient of crude fiber of group I, II, III and IV were 51.64%, 52.91%, 52.13% and 53.59% respectively. The crude fiber digestibility was highest in group IV followed by II, III and I although there was no significant difference between the groups. Beneficial effects of dietary additives such as antibiotics and probiotics on nutrient utilization in poultry have also been reported [7-10].

The intake, balance and percentage of retention of nitrogen, calcium and phosphorus have been presented in table 3. The percentage of retention of nitrogen of group I, II, III and IV were 60.60, 61.15, 60.99 and 61.11 respectively and were almost similar in all the groups. The percent retention of nitrogen in broiler chicks was almost similar in antibiotic and probiotic fed group with that of the control birds which is parallel to our findings [11].

The percentage of retention of calcium ranged from 50.98 to 54.90 while that of phosphorus ranged from 52.71 to 59.70. The percentage of retention of calcium and phosphorus were found to be slightly higher in group II, III and IV than group I. On statistical analysis it was found that there was no significant (P<0.05) difference between the different groups. There was more retention of calcium and phosphorus in broiler chicks when antibiotic and probiotic was added in low level in the diet [12]. Our findings were in good agreement with this report.

Table 2: Intake and digestibility coefficient of different organic nutrients in broiler birds of different experimental groups

Nutrients	Treatments	Intake (gm)	Voided in faeces (gm)	Dry matter digested	Digestibility co-efficient (%)
Dry matter	Group I	165.01	52.14	112.87	68.40
	Group II	165.91	51.71	114.02	68.83
	Group III	166.80	52.06	114.74	68.79
	Group IV	172.19	53.65	118.54	68.84
Crude protein	Group I	32.36	12.76	19.60	61.11
	Group II	32.53	12.65	19.88	61.92
	Group III	32.71	12.78	19.93	60.92
	Group IV	33.77	13.15	20.62	61.06
Ether extract	Group I	9.41	3.40	6.01	63.87
	Group II	9.46	3.25	6.21	65.64
	Group III	9.51	3.13	6.38	67.09
	Group IV	9.81	3.19	6.62	67.82
Crude fibre	Group I	9.74	4.72	5.03	51.64
	Group II	9.79	4.61	5.18	52.10
	Group III	9.84	4.71	5.13	52.13
	Group IV	10.15	4.71	5.44	53.59

Table 3: Intake, balance and percentage retention of nitrogen and phosphouus of broiler birds of different experimental groups

Mineral	Treatments	Intake (gm)	Excreted (gm)	Balance (gm)	% of retention
Nitrogen	Group I	5.18	2.04	3.14	60.62
	Group II	5.20	2.02	3.18	61.15
	Group III	5.23	2.04	3.19	60.99
	Group IV	5.40	2.10	3.30	61.11
Calcium	Group I	2.73	1.36	1.37	50.18
	Group II	2.75	1.32	1.43	52.00
	Group III	2.77	1.34	1.43	51.62
	Group IV	2.86	1.29	1.57	54.90
Phosphorus	Group I	1.29	0.61	0.68	52.71
	Group II	1.29	0.58	0.71	55.04
	Group III	1.30	0.57	0.71	56.15
	Group IV	1.34	0.54	0.80	59.70

3.2 Economics of feeding: Determination of cost of feeding per unit body weight gain would provide a well required interpretation of economics as we know that feed cost alone consist of about 70 percent of the total production cost of broiler. It would give us the clear-cut information about the benefit of using growth promoter in broiler feed. This would depend upon the cost of growth promoter in the study and its ability of utilizing the feed nutrient efficiently.

For determining the economics of feeding on the basis of cost of feeding per kg live weight gain for birds fed basal diets without or with antibiotic and probiotic singly or in combination the average values have been presented in the table 4. The average cost per kg diet have been worked out to be Rs 21.65 for group I. With the supplementation of different growth promoters such as antibiotics and probiotics, the cost of basal diet increased marginally viz. Rs 21.95 for antibiotic supplemented group, Rs 21.80 for probiotic supplemented group and Rs 21.85 for combined supplementation of antibiotic and probiotic. On the basis of feed consumed per kg weight gain the cost of feeding per kg weight gain were found to be Rs 40.92, Rs 39.73, Rs 40.76 and Rs 39.77 for group I, II, III and IV respectively. This showed that instead of diets being costlier, the cost of feeding per kg weight gain were cheaper in the treated groups. The birds fed with antibiotic showed the least costlier than the other groups though non significant. The cost of feeding per kg weight gain found to be highest in control group compared to other groups. The higher cost of feeding per kg weight gain in control group was due to higher consumption of feed per kg body weight gain in the control group compared to the three treated groups. The cost difference over control in group II, III and IV were Rs 1.19, Rs 0.16 and Rs 1.15 respectively. Buche *et al.* (1992) also found that probiotic feeding resulted in higher average profit over control.

Table 4: Average Cost of feeding per kg weight gain of broiler birds of different experimental groups

Treatments	Cost /kg diet(Rs)	Feed consumed per/kg weight gain	Cost of feeding/ kg Weight gain (Rs)	Cost difference over control (Rs)
Group I	21.65	1.89	40.92	
Group II	21.95	1.81	39.73	(-)1.19
Group III	21.80	1.87	40.76	(-)0.16
Group IV	21.85	1.82	39.77	(-)1.15

The findings of this study evidenced that the presence or absence of probiotics had no significant. Effect on the nutrient utilization in birds but was better in the treatment groups in comparison to the control birds. Also a certain amount of economics benefit can be derived by supplementing antibiotic and probiotic and more particularly in combination. However, a feeding trial with large numbers of birds and at different dose is required to establish the fact regarding supplementation of growth promoter as economic benefit in broiler industry.

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