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Study on the Effects of Antibiotic (Lincomycin) and Feed Additive (Niacin) on the Growth of Broilers

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Abstract: In order to investigate the comparative effect of commercial feed antibiotic (Lincomycin) and feed additive (Niacin) on the growth of broiler, this study was carried out using 200 day-old Hubbard broilers chicks, housed for 42 days experimental period. Broilers in group A were kept as (control), while broilers in group B were given antibiotic (Lincomycin), in group C, the broilers were given feed additive (Niacin) and the broilers in group D were given both feed antibiotic and feed additive. The results showed that the average live body weight broiler was 2131, 2146, 2036 and 2153 grams,(P>0.05), in A, B, C and D groups, respectively. Average feed consumption of broiler was 3746, 3730, 3708 and 3689 grams, (P>0.05), in A, B, C and D groups, respectively. Average water intake of broilers was 9256, 9259, 9274 and 9276(P>0.05) in A, B, C and D groups, respectively.Feed conversion ratio for group A, B, C and D was calculated to be 1.75, 1.73, 1.73 and 1.71, respectively. Average carcass weight of broilers was 1315 in group D, followed by the B (1302 g/b), C (1296 g/b) and control group (1292 g/b), (P>0.05).The average carcass percentage of the broilers was carcass percentage in group A (60.40), followed by the B (60.67), C (60.80) and D (61.04), respectively. Average liver weight in groups A, B, C and D was 41.33, 41.40, 41.26 and 42.25 g/b, (P>0.05)respectively. Average heart weight in groups A, B, C and D was 7.40, 7.48, 7.50 and 7.61 g/b (p>0.05), respectively. Average gizzard weight in groups A, B, C and D was 35.42, 35.74, 35.90 and 36.18 g/b (p>0.05), respectively. The mortality in group A, B, C and D, were 10.0, 6.0, 8.0 and 6.0 percent respectively. Net profit of Rs. 24.55, Rs. 26.88, Rs. 26.85 and Rs. 29.53 per broiler was earned from group A, B, C and D, respectively. On the basis of present study, it was concluded that there is non-significant difference among the live body weight, feed intake, FCR, carcass weight, carcass percentage, liver weight, heart weight, gizzard and spleen but the study showed that both Lincomycin and Niacin in combination have little better effect on broiler growth as compared to other groups under our local conditions.

Key words: Broilers · Lincomycin · Feed additive · Growth

INTRODUCTION

Pakistan is an agricultural country producing a wide range of agricultural field crops along with livestock and poultry products. Poultry industry is a relatively 2nd established agro-based industry which also plays a vital role in bridging the gap between supply and demand of animal proteins and in keeping the prices of beef, mutton and other food items at reasonable level [1]. In the country poultry sector provides employment to 1.5 million people and its contribution to agriculture and livestock is about 6.4 percent and 11.5 percent, respectively. In 2011, the National total no. of poultry bird population in the country is about 170 million in which Punjab contributes about 35.18%, Sindh 19.19%, KPK 37.60% and Balochistan 8.02% share to the Pakistan poultry bird's production [2]. Poultry bird's population is progressively increased from last few years.

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It is well known that antibiotic supplementation in the diet improves growth rate and feed efficiency in domestic animals and poultry. Because antibiotic supplementationmay result in bacterial resistance to antibioticsand residues of antibiotics may be hazardous tohuman health, antibiotic supplementation should be limited and alternative sources of equal efficacy need to be evaluated [3]. Antibiotic growth promoters (AGP) were used in the livestock and poultry diet to improve their growth, feed consumption, feed utilization and health for more than half a century [4, 5].

Antibiotics are powerful medicines that fight against bacterial infections.Growth-promoting antibiotics are products which are incorporated into birds feed to create favourable conditions in the intestine for the digestion of food. They are mainly used to improve feed conversion efficiency (which means less food is required per unit live weight gain). The efficiency of a bird's digestion is dependent on the micro-organisms which live naturally in its digestive tract – some improve digestion, others make it less effective. Added to the feed of poultry, growth-promoting antibiotics neutralize adverse micro- organisms which live in the bird's gut.Beneficial effects of dietary additives on the energyand protein utilization of poultry have been reported [6- 9]. It has also been suggested that feed additives may be moreefficient when low nutrient diets are fed. Generally, low density diets are more profitable and resulted in lessenvironmental pollution problems. In recent years, the high price of protein sources as well as environmentalconcerns related to high nitrogen excretion have resulted in increasing interest for using low protein diets inpoultry production [10].

Keeping in vie the above facts, study was designed to evaluate the effect of lincomycin and niacin on growth of broiler as well as economic feasibility of broiler production was also assessed.

MATERIALS AND METHODS

The study was carried out to determine the comparative study of commercial feed antibiotic (Lincomycin) and additive (Niacin) on the growth of broiler. The experiment was conducted at Poultry Experiment Station, Department of Poultry Husbandry, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University, Tandojam. Hubbard 200, 'day-old' chicks were purchased from Hyderabad and brought to Experiment Station.

Experimental Design: Chicks were initially weighed and on the basis of equal mean weight divided into four groups, A, B, C and D, having 50 chicks in each group. In the 42 days experimental trial following treatment was given in the feed.

Table 1: Feeds mixed with and without antibiotic and additive for broilers

	Groups			
Treatments	A	B	C	D
	Feed without antibiotic (Lincomycin) and additive (Niacin) (Control)	Feed mixed with antibiotic (Lincomycin) @ 6.5mg/kg of Feed	Feed mixed with additive (Niacin) @ 25mg/kg of feed	Feeds mixture (B+C) Contains both antibiotic (6.5mg/kg) and additive (25mg/kg) in a feed

Same ratio of feed antibiotic and feed additive was used in starter, grower and finisher rations.

Table 2: Ingredients and formulation of basal diet

Ingredients	Starter Feed (%)	Finisher Feed (%)
Rice	31.6	40.0
Maize	10.0	10.0
Rice polish	15.0	16.0
Fish meal	8.5	8.0
Soya bean	7.0	5.5
Guar meal	5.0	4.0
Canola meal	11.5	8.0
Rape seed meal	3.3	3.0
Sunflower	7.0	4.4
Lime stone	1.1	1.1
Total (kg)	100	100
Nutritive values		
Crude Protein (k cal/kg)	21	19
Metabolizing Energy (k cal/kg)	2800	2950

Management

Housing: The deep litter housing system was offered to the chicks, where one square feet space was provided to each chick. Brooding preparation was completed two days before the arrival of day old chicks, where one brooder was provided to each group. During first week, brooding temperature was maintained between 90 to 950F till the house temperature reached 700F. Lighting was provided throughout the day and night. The wooden dust was used as litter, before spreading it on the floor, the litter was dried under sunlight over 12 hours and checked and taken out its thick material to maintain litter quality.Feed and water were provided *ad libitum.*Vaccination from time to time through different routes of administration for new castle disease, infectious bursal disease, infectious bronchitis and hydropericardium syndrome was carried out.

The Following Parameters Were Studied

Feed Intake: Feed was provided to the broiler twice daily and refusal of feed was calculated from feeder of each group and weighed and finally consumed feed was recorded daily.The feed intake was calculated by following formula:

$$\text{Feed intake (g/b/d)} = \frac{\text{Total feed offered - Total feed refused}}{\text{Total Broilers}}$$

Water Intake: Fresh water was provided to the broiler twice daily. Refusal of water was collected, measured and subtracted from the water offered and finally consumed water was recorded by using the following formula:

$$\text{Water intake (m/b/d)} = \frac{\text{Total water offered (ml) - Total water refused (ml/group/d)}}{\text{Total broilers}}$$

Live Body Weight: After arrival of day old broiler at Poultry Experimental Station, individual chicks were weighed by using electric weighing scale and later broilers were weighed at the completion of week in their respective groups and recorded.

Mortality: Dead birds were collected when observed on daily basis; mortality was recorded and finally, the mortality rate was calculated by using the following formula:

$$\text{Mortality (\%)} = \frac{\text{Total No. of broiler died}}{\text{Total reared broilers}} \times 100$$

Carcass Weight: On the completion of experimental period of 42 days,randomly 5 broilers from each group were collected, weighed and slaughtered. After dressing, the carcass weight was recorded and its dressing percentage was calculated by using the following formula:

$$\text{Dressing (\%)} = \frac{\text{Total carcass weight (kg)}}{\text{Total live weight (kg)}} \times 100$$

Weight of Edible and Non-Edible Parts: After slaughtering of 5 broilers from each group, the liver, heart, gizzard, abdominal fat and intestine were removed / separated with the help of scalpel and scissor and weighed by electric balance separately and recorded.

Economics: All expenditure on various items was recorded on daily basis of each group separately and at the end cost of per broiler and total income was calculated separately for each group. Net profit was calculated by subtracting total cost from total income.

Data Analysis: The collected data were tabulated and analyzed by using statistical program, SPSS 2007.

RESULTS

The study was conducted to investigate the effect of feed antibiotic (Lincomycin) and feed additive (Niacin) on the growth of broilers. The results on parameters, initial and final body weight, feed and water consumption, carcass weight, weight of giblets, mortality and economics are very promising.

Initial Body Weight: The average initial weight was recorded at the start of experiment as under. Average broiler weight was 42.10, 42.04, 42.05 and 42.14g in Group A, B, C and D, respectively.

Feed Intake: Average feedintake ofbroiler is presented in Table4. The feedintake was comparatively more in group A 3746 g/b, followed by the B(3730g/b), C (3708 g/b) and D(3689g/b), respectively, but the statistical analysis showed that there was non-significant in feed intake difference among the groups.

Water Intake: Average water intake of broiler is presented in Table5. The water intake was comparatively more in group D(9275 ml/b), followed by the C (9274 ml/b), B (9259 ml/b) and A (9256 ml/b), but the statistical analysis showed that there was non-significant difference in water intake among the groups.

Table 3: Average initial live body weight of broilers.

Groups	A	B	C	D
Live Body weight (g/b)	42.10	42.04	42.05	42.14

Table 4: Average feed consumption of broilers (g/b).

Groups	A	B	C	D
Feed Consumed (g/b)	3746	3730	3708	3689

Note: S.E ± = 23.184, F. Value = 2.32 and P. Value = 0.1143

Table 5: Average water consumption of broilers.

Groups	A	B	C	D
Water consumed (ml)	9256	9259	9274	9276

Note: S.E ± = 12.53, F. Value = 1.30 and P. Value = 0.3080

Table 6: Average final live body weight of broilers.

Groups	A	B	C	D
Final Body weight (g/b)	2131	2146	2136	2153

Note: S.E ± = 10.272, F. Value = 1.70 and P. Value = 0.2063 Furthermoreaverage growth of broilers showed similar pattern between the groups.

Table7: Average growth of broilers.

Groups	A	B	C	D
Average Growth (g/b)	2089	2103	2094	2110

Note: S.E ± = 10.11, F. Value = 1.67 and P. Value = 0.2130

Table 8: Feed conversion ratio of broilers.

Groups	A	B	C	D
FCR	1.75	1.73	1.73	1.71

Note: S.E ± = 7.638, F. Value = 1.67 and P. Value = 0.7031

Table 9: Average carcass weight of broilers.

Groups	A	B	C	D
Carcass weight (g/b)	1292	1302	1296	1315

Note: S.E ± = 9.674, F. Value = 2.12 and P. Value = 0.1385

Table 10: Average dressing percentage of broilers.

Groups	A	B	C	D
Dressing Percentage	60.40	60.67	60.80	61.04

Live Body Weight: Average live body weight ofbroiler is presented in Table-6. The result showed slightly more live body weight in group D (2153 g/b), followed by the B (2146 g/b), C (2136 g/b) and A(2131g/b), respectively.But the statistical analysis of live body weight showed that there was non-significant difference among the groups.

Feed Conversion Ratio: Group wise result showed that FCR of group D, 1.71 was better than 1.73 of both groups B and of group C (1.73) and control group (1.75). Statistical analysis showed that there was a significant difference among the groups.

Carcass Weight: Average carcass weight of broiler is presented in Table9. The result showed slightly increase in carcass weight in group D (1315) g/b, followed by the B (1302g/b), C (1296 g/b) and A (1296g/b), but the statistical analysis of carcass weight showed that there was non-significant difference among the groups.

Table 11: Average liver weight of broilers.

Groups	A	B	C	D
Weight of liver (g/b)	41.33	41.40	41.26	42.25

Note: S.E ± = 0.4790, F. Value = 1.86 and P. Value = 0.1777

Table 12: Average heart weight of broilers.

Groups	A	B	C	D
Weight of heart (g/b)	7.40	7.48	7.50	7.61

Note: S.E ± = 0.0757, F. Value = 2.78 and P. Value = 0.0751

Table 13: Average gizzard weight of broilers (g/b).

Groups	A	B	C	D
Weight of gizzard (g/b)	35.42	35.74	35.90	36.18

Note: S.E ± = 0.6221, F. Value = 1.34 and P. Value = 0.2972

Table14: Average mortality percent of broilers.

Groups	A	B	C	D
Broiler #	5	3	4	3

Note: S.E ± = 0.5965, F. Value = 2.54 and P. Value = 0.0930

Dressing Percentage: The dressing percentage of group A, B, C and D was recorded as 61.40, 60.67, 60.80 and 61.04(%), respectively.

Liver Weight: The data in Table11 indicated that the average liver weight in groups A, B, C and D was 41.33, 41.40, 41.26 and 42.25 (g/b), respectively. The liver weight was comparatively more in broiler of group D as compared to rest of the groups. The difference between group means was non-significant ($p>0.05$).

Heart Weight: The data in Table12 indicated that the average heart weight in groups A, B, C and D was 7.40, 7.48, 7.50 and 7.61 g/b ($p>0.05$), respectively. The heart weight was tend to be more in broilers of group D as compared to rest of the groups.

Gizzard Weight: The data in Table13 indicated that the average gizzard weight in groups A, B, C and D was 35.42, 35.74, 35.90 and 36.18 g/b ($p>0.05$), respectively.

Mortality Rate: The results showed (Table14), that mortalities of broilers in group A, B, C and D, were 10.0, 6.0, 8.0 and 6.0 percent, respectively. The mortality rate was comparatively more in broiler of group A as compared to rest of the groups. The difference between group means was non- significant ($p>0.05$). The overall 15 broilers were died (7.5%) out of 200 during six week.

Economics: Cost of feed for control group was Rs. 44 per kg for all 4 groups. Average per broiler fed cost for group A, B, C and D was164.86, 164.12, 163.15 and162.51 rupees respectively. Average per broiler cost of treatment for

Table 15: Economics of broilers (Rs/b).

S. No	Economic parameters	Groups A	B	C	D
1	Cost of day old chick (Rs/b)	32	32	32	32
2	Cost of feed (Rs/b) 164.86	164.12	163.15	162.51	
3.	Cost of treatment (Rs/b)	0	0.025	0.12	0.14
4.	Miscellaneous Expenses(Rs/b)	18	18	18	18
5.	Total Expenditure (Rs/b)	214.86	214.14	213.27	212.44
6.	Income from sale of broilers(Rs/b)	234.41	236.06	235.00	236.83
7.	Income from sale of empty feed bags and litter	05	05	05	05
8.	Total Income (5+6) (Rs/b)	239.41	241.06	240.	241.83
9.	Net Profit (7-5) (Rs/b)	24.55	26.92	26.74	29.40

group A, B, C and D was 0, 0.025, 0.12 and 0.14 rupees respectively. Total production cost per broiler was214.86, 214.145, 213.27 and212.44 rupees for group A, B, C and D respectively. After marketing, per broiler income of group A, B, C and D was239.41, 241.06, 240.0 and 241.83 rupees with the profit of24.55, 26.92, 26.74 and 29.40 per boiler respectively.

DISCUSSION

Different antibiotics have been traditionally administered to livestock and poultry in order to prevent bacterial diseases, as well as adverse stress responses. They are readily available, cheap therapeutic agents that have allowed farmers to increase production and save on expensive feed that can be up to 70 percent of production cost [11]. Use of Lincomycin has been increasing tremendously due to its greater effectiveness against poultry disease. In addition to antibiotic, feed additive has been being brought under consideration due to its beneficial influence on broiler growth and health. Therefore this present study was carried out to investigate the comparative effect of Lincomycin (antibiotic) and Niacin (additive) on the performance of broiler under our local environmental conditions.

Present study indicated that average live body weight of different groups showed little variation. Maximum final body weight was recorded in group D, 2153 followed by the B, 2146, C, 2136 and A, 2131 g/b, but the statistical analysis showed that there was non-significant difference among the groups. Several feed antibiotics have been reported to improve growth performance when supplemented in diets [12], however in most cases growth performance of chicks was unaffected by the addition of feed antibiotic [13]. In present study growth performance was not significantly affectedby dietary treatments; in agreement with the present study, Gunal *et al.* [13] reported that at the end of the study period, there was no significant improvementin performance of broilers when feed antibiotic was used. Similar results have been reported by Proudfoot *et al*. [14], Zakeri and Kashefi [15], Sarica *et al.* [16] and Bozkurt *et al*. [17] Lincomycin showed non-significant effect on the growth performance of broilers.

Jiang *et al*. [18] reported thatnicotinic acid(NA/kg) a niacin compound had significant effect on average live body weight. Generally, results reported in the literature on the beneficial effects of feed antibiotics and feed additives on broiler growth performance are inconsistent. Numerous factors such as the environment,management, nutrition, additive type, dosage and bird characteristics (age, species, stage of production) can affect broiler responses to growth promoters (Yang *et al*., 2009 [19], thereby accounted for the contrasting results. Farm rearing condition is a major factor contributing to variable results. Many bacterial species compete with the host for nutrients and the uptake of amino acids. Amino acids digested by bacteria can be fermented, producing toxic catabolites (like ammonia) that increase epithelial cell turnover, decrease growth performance [20]. Present study showed that niacin has non-significant effect on the live body weight of broilers in agreement with the Oloyo [21], who reported that niacin has no significant effect on the live weight gain when used in concentration of 15-30mg. These finding were also in agreement with the Celik *et al.* [22] andRuiz and Harms [23]. It can be concluded that there was non-significant but little better interaction between feed antibiotic (Lincomycin) and feed additive (Niacin) for body weight growth as compared to control group.

The result showed lowest total feed intake in group, D supplemented with both antibiotic and feed additive as compare to other groups, butthe statistical analysis showed that there was non-significant ($P > 0.05$) difference among the groups. In the current study, chicks kept in D

group showed little better performance as compared to control group. The non-significant results were observed after the completion of trail, there may be few reasons for the non significant results.This might be due to the buffering capacity of the diet, presence of other antimicrobial compounds, acid type and concentration, composition of diet and environment of the experiment could be considered as responsible factors for inconsistency in results [24]. Hooge[25], also suggested that in case of well -nourished healthy chicks housing at a moderate stoking density, dietary inclusion of additive was ineffective on bird's performance. On the other hand beneficial effects of the most growth promotersare revealed particularly when flocks encounter stress conditions andailments.Effect of feed antibiotic and additive did not significantly affect body weight, feed intake. Similar results have also been reported by Gunal *et al*. [13], Zakeri and Kashefi [15], Sarica *et al.* [16], Bozkurt *et al*. [17], Oloyo [21], Celik *et al.* [22], Ruiz and Harms [23].

As for as FCR is concern present findings showed that better FCR was seen in group D, as compared to other groups. Feed efficiency of birds receiving both supplemented diets improved incomparison to control birds. Bedford [27] reported that, a more balanced biota population ingut could lead to a greater efficiency in digestibility and utilization of food, resulting in an improved FCR. Ferket [28] also reported that antibiotics may control and limit the growth and colonization of a variety of pathogenic and nonpathogenic species of bacteria in chicks gut. Antibiotic and feed additive might be a reason for the increased jejunum crypt depth, villus width and epithelial thickness. Indeed, this increasing of jejunum villus width caused to better absorption of food material on broiler chicken at 42 days of age. Villi are responsible for absorption of food material [29]. Any change in villus height lead to a change in absorption rate. Both antibiotic and feed additive has better effect on FCR when used in group D,

Carcass weight showed the same pattern. Lincomycin and Niacin inclusion had no detrimental effect on carcass. Carcass weight of group D1245 was little better than group B 1234 g, group C 1241 g and group A1228 g/b. He also reported non-significant difference in carcass weight while using feed antibiotic.He concluded that niacin had non-significant effect on carcass weight and carcass yield.Since there was no difference in dressing percentage between dietary treatments, the observed differences in carcass yields must have been due to differences in final body weights of different treatments at slaughter time.

The findings regarding weight of giblets aresimilar to previous researches. Weight of giblets result showed the same pattern as reported by Sarica *et al.*[16] and Bozkurt *et al.*[17]. They reported no significant difference in weight of giblets. The data for weight of giblets in this study showed no significant difference. It was proved that antibiotic and additive do not have any negative effect on giblets because no abnormality was seen in the weight of giblets of antibiotic and feed additive fed broilers.

The mortality losses in chickens attributable to various known and unknown factors accounted for a great loss annually.There was no significant difference in the rate of mortality in the all treatments during whole period of experiment, but antibiotic treated groups showed little better effect as compare to other groups. There were no disease or pathological lesions recorded in the organs of slaughtered birds. Whereas reduced mortality was observed in two groups which were supplemented with antibiotic as compared with other groups this result is sported by Gunal *et al.* [13] who reported that mortality was not significantly affected by antibiotic treatment throughout the experiment. He reported that lincomycin had no significant effect on mortality. Ruiz and Harms [23] also reported that niacin had no effect on the mortality. Currentfindings regardingto mortality are also in the agreement with the Bozkurt *et al.* [17] and Zakeri and Kashafi [15]. The economic efficiency of the experimental treatments showed that Dgroup was proved to be cheapest and group A was costly among all. It may be due to the better feed conversion of birds in D group as compared to other treatment groups.He also reported that lincomycin had no significant effect on economics but non-significantly better than control group.

It was noted from this research and other parts of the world are on the similar aspects that those broilers which were fed with antibiotic (Lincomycin) and feed additive (Niacin), they gained more weight, less feed intake, lower feed conversion ratio and finally they were reared more economical as compared to the broilers which were fed without Lincomycin and Niacin. The main purpose of this study was to examine the influence of Lincomycin and Niacin to improve growth performance of the broilers and to know that which way of feeding is more economical and beneficial for the farmers.

CONCLUSIONS

On the basis of present study, it was concluded that there is non-significant difference among the all recorded

parameters *i.e.* live body weight, feed intake, carcass performance and mortality. Feed antibiotic (Lincomycin) mixed with feed additive (Niacin) and both were used as growth promoter in combine with the ratio of 6.5 and 25mg has comparatively influence on the growth of broiler.

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