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Growth Performance of Broilers as Affected by Different Levels of Ground Limestone

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Abstract: **This study aimed to find out the effect of different levels of ground limestone to the growth of broilers. specifically, to determine the best level which could give the highest production and high profits and to know the effect of ground limestone to carcass of broilers. A total of 96 two weeks old chicks were randomly distributed to four dietary treatments using completely randomized design (CRD). The treatments were 100% commercial feeds (CF), 95% CF + 5% ground limestone (GL), 90% CF + 10% GL and 85% CF +15% (GL). Each treatment was replicated three times with 8 birds per replication. The experiment was conducted at Apayao State College San Isidro Sur, Luna, Apayao from August 15, 2007 September 25, 2007.**

In terms of final weight, Birds fed with 100%CF obtained the highest final weight which is significantly higher than birds fed with 15% GL but comparable to birds fed with 5% GL and 10% GL. The results indicate that replacing CF with 15% GL significantly decreased the final weight of broilers.

In terms of feed consumption experimental birds consumed comparable amount of feed. As to total and daily gain in weight birds fed 100% CF and 5 % GL significantly gained more weight than those birds fed with 10% and 15% ground limestone replacement. Birds fed with 100% CF and 5% GL had comparable average daily gain in weight but significantly higher than those birds fed with 10% GL and 15% GL. This means that replacing CF with 10% GL and 15% GL significantly reduce the daily gain in weight of the birds.

In terms of feed conversion efficiency Birds fed with 15% GL and 10% GL significantly consumed more feed (3.70 and 3.21 kg) to gain one kilogram body weight compared to birds fed with 5% GL and 100% CF (2.81 kg and 2.77 kg). This means that birds fed with 10% GL and 15% GL were less efficient converters of fed to meat.

As to feed cost birds fed with 15% GL obtain the highest feed cost followed by 10% GL. Birds fed with 5% GL obtained the lowest feed cost. Replacing CF with 5% GL significantly reduce the feed cost from Php 57.15 to Php 56.41. However it was observed that replacing CF with GL at higher levels significantly increase the feed cost.

Based on carcass evaluation all treatments has comparable bled weight, carcass weight, weight of the cut up parts (Head, Shank,drumstick,breast) and weight of internal organs (Liver, heart,intestine and gizzard)

Keywords: **Broiler, Ground Limestone, Experimental bird, Feed, dietary treatment.**

1. INTRODUCTION

The poultry industry in the Philippines has significantly developed during the past several decades from just a subsistence production system before the 1960's to a multi-billion dollar. Modern integrates poultry eggs under intensive production systems. In terms of population, it is the largest in the livestock sectors.

The poultry industry is dominated by chicken [1] is the most popular poultry species among poultry animals. The total poultry population is 140, 616, 592 as of 1997 (Bureau of Agriculture Statistics 1997). Native improved strains contributed 76,938, 831. The major producing regions are western Visayas, southern Mindanao and central Visayas. It is also the most highly automated, vertically integrated and intensified among all the animals production industries. Its meat component consists primarily of chickens with a relatively small amount coming from ducks and other minor poultry species such as quails, turkeys, pigeons and guinea fowls.

This day the cost of feeds is the biggest problem of broilers raises .So some raisers add feed supplement such as limestone as replacement of commercial feeds to lessen the feed cost.

Limestone is rich in calcium (38%) it can prevent osteoporosis and rickets and calcium required for heart muscle contraction and in regulating heart beat. Also assist in the utilization of iron helping it pass through the cell wall thereby providing strength and energy. Limestone is the most abundant sedimentary rocks [2]. And limestone composed of the mineral calcite (calcium carbonate CaCo3) and or the mineral dolomite (calcium and magnesium carbonate MgCo3) [3]. Limestone may be ground or granulated [4]. It is the best source of calcium for animals [5].(Philippines Recommends for livestock Feed formulation [6]

Objectives

Generally this study was conducted to compare the effect of different levels of ground limestone mixed with commercial feeds on the growth of broilers. And aimed to determine the best level that could give the highest production and high profit.

Time and place of the study

This study was conducted at Apayao State College Campus, San Isidro Sur, Luna, Apayao from August 15 to September 25, 2016.

2. MATERIALS AND METHODS

Materials

Materials used in the study were 96 broiler chicks, ground limestone, 2 electrical bulbs (50 watts) commercial feeds, feeders, waters, weighing scale, antibiotics, vitamins, disinfectant, bamboo, recording book, hummer and other essential to the study.

Methods

Experimental design and treatments bb

Ninety six chicks were distributed to four dietary treatment laid in a completely randomized design (CRD).

Treatment were replicated three times with 8 birds per replication. The treatments were as follows:

T_1 =100% Commercial Feeds (CF)

T_2 = 95% CF+5% ground limestone (GL)

T_3 = 90% CF +10% ground limestone

T_4 = 85% CF +15 ground limestone

Statistical Analysis of Data

All the data was gathered and statistically analyzed using analysis of variance ANOVA for completely randomized design (CRD) and Duncan multiple range test (DMRT)

Collection and preparation of feeding materials

Limestone were collected from the mountain .This were grounded by using hummer and mixed with commercial feed following the levels indicated in the treatments.

Preparation of the experimental area

A week before the arrival of the chicks and before the start of the study. Cages, feeders and waterers were repaired cleaned and disinfected to prevent the occurrence of diseases.

Brooding Management

Before the arrival of the chicks the electric bulb were installed to provide light and heat for the chicks.

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Sacks were place around the cages to maintain heat. Rice hull and news paper served as litter to maintain cleanliness, and dryness of the floor.

Feeding and other management

The experimental birds were given chick booster for the first two weeks and gradually shifted to experimental ration. Dry and adlibitum feeding was used in all treatments. Clean and fresh water was provided at all the times.

3. RESULT AND DISCUSSION

Table 1: Initial weight (grams) of broilers used in the study

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	246.2	219.3	219.5	685	228.33
T_2 = 95% +5% ground limestone	230.8	229.2	226.6	686.6	228.86
T_3 = 90% CF +10% ground limestone	221.9	226.3	222.9	671.1	223.7
T_4 = 85% +15% ground limestone	231.1	226.1	234.1	691.3	230.43
Grand total				2734	
Grand mean					227.83

This table shows the initial weight of the birds. Analysis of variance showed no significant differences in the initial weight of the birds. This means that the birds had comparable weight at the start of the study.

Table 2: Weight (grams) of broiler at 28 days old fed with different levels of ground limestone

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	611.12	563.87	536.37	1711.36	570.45 a
T_2 = 95% +5% ground limestone	561.18	596.25	529.75	1687.18	562.39 a
T_3 = 90% CF +10% ground limestone	501.43	566.62	510.62	1578.67	526.22 a
T_4 = 85% +15% ground limestone	465.37	467.76	458.87	1391.99	468.00 b
Grand total				6369.20	
Grand mean					553.76

Note: Treatments mean with the same latter are not significant to each other using DMRT.

The second weekly weight of experimental birds is presented in table 2a. Analysis of variance showed significant differences among treatment means. Birds fed with 100% CF were significantly heavier compared with birds fed with 15% GL but comparable to 5% GL and 10% GL.

Table 2a: Weight (grams) of broilers at 35 days fed with ration with different levels of ground limestone.

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	908.75	848.75	981.25	2738.75	912.92 a
T_2 = 95% +5% ground limestone	913.75	961.2	883.75	2758.75	919.58 a
T_3 = 90% CF +10% ground limestone	765.00	838.75	753.75	2357.50	785.83 b
T_4 = 85% +15% ground limestone	671.25	693.75	672.50	2037.50	679.17 c
Grand total				9892.50	
Grand mean					824.38

Note: Treatment means at the same letter are not significant to each other using DMRT.

Weight of bird at the third week of feeding period is presented in table 2b. Analysis of variance showed Highly significant differences among the treatment means. Broiler fed with 100% CF and 5% GL were significantly heavier compared to birds fed with 10% GL and 15% GL. However T3 is significant over T4.

Table3: Final Weight (kg) Broiler fed with different levels of ground Limestone.

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	1.34	1.27	1.16	3.77	1.26 a
T_2 = 95% +5% ground limestone	1.25	1.23	1.24	3.72	1.24 a
T_3 = 90% CF +10% ground limestone	1.07	1.24	1.02	3.33	1.11 a
T_4 = 85% +15% ground limestone	1.02	0.96	1.00	2.96	0.99 b
Grand total				12.78	
Grand mean					1.15

Note: Treatment means with the same letter are not significant to each other using DMRT.

The final weight of the experimental birds after 28 days of feeding trial is presented in table3.Analysis of variance showed highly significant differences among the treatment means. Birds fed with 100%CF is significantly heavier compared to bird fed with 15% GL but comparable to birds fed with 5% GL and 10% GL.

The result indicates that significant difference in the final weight of broilers is manifested by replacing commercial feeds with 15% ground limestone .

Table 4: Total feed consumption (grams) of bird fed with different levels of ground limestone.

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	28.48	2845.65	2822.61	8516.26	2838.75
T_2 = 95% +5% ground limestone	2833.36	2842.72	2835.85	8511.96	2837.31
T_3 = 90% CF +10% ground limestone	2799.56	2845.11	2811.83	8456.50	2818.83
T_4 = 85% +15% ground limestone	2821.59	2839.38	2785.36	8446.33	2815.44
Grand total				33931.02	
Grand mean					2827.58

Table 4 showed the total feed consumption of the birds fed with different levels of ground limestone. Analysis of variance showed no significant differences among the treatments. This means that birds consumed comparable amount of feed during the conduct of the study. Based on the result limestone did not affect the acceptability and palatability of the ration. Carmeuse uses milled limestone as chicken feed pointed out the following benefits: Source of calcium for bone development, formation of eggshell, and Meet stringent requirements of farming industry [7]

Table 5: Total gain in weight (grams) of bird fed with different levels of ground limestone.

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	1093.8	1050.7	940.5	3085	1028.33 a
T_2 = 95% +5% ground limestone	1019.3	1000.8	1013.4	3033.5	1011.16 a
T_3 = 90% CF +10% ground limestone	847.1	1013.7	797.1	26579	885.597 b
T_4 = 85% +15% ground limestone	788.9	7.339	765.9	2288.7	762.90 c
Grand total				11065.10	
Grand mean					922.09

Note: Treatment mean, T1 and T2 had the same letter are not significant to each other using DMRT.

Table 5 shows the total gain in weight of bird. Highly significant differences were observed on the total gain in weight of the birds. Broilers fed with 100% CF and 5% GL significantly gain more weight than those fed with 10%GL and 15% GL. However birds fed with 10%GL significantly gain more weight than birds fed with 15% GL.

Table 6: Average Daily Gain in weight of birds (grams)

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	39.06	37.52	38.58	110.16	36.72 a
T_2 = 95% +5% ground limestone	36.40	35.74	36.19	108.33	36.11 ab
T_3 = 90% CF +10% ground limestone	3.025	36.20	28.46	94.91	31.58 b
T_4 = 85% +15% ground limestone	28.17	26.21	27.35	81.73	27.24 c
Grand total				395.13	
Grand mean					32.91

Note: Treatment mean with the same letter T1 and T2 are not significant to each other using DRMT.

Table 6 shows the average daily gained in weight of broilers fed with different levels of ground limestone. Analysis of variance showed significant differences among treatment means. Birds fed with 100% CF and 5% GL had comparable average daily gain in weight but significantly higher than those birds fed with 10% GL and 15% GL. This means that replacing CF with 10% GL and 15% GL significantly reduce the daily gain in weight of the birds.

Table 7: Feed Conversation efficiency (kg) feed /kg gain in weight of bird fed with different levels of ground limestone.

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	2.60	2.71	3.00	8.31	2.77 c
T_2 = 95% +5% ground limestone	2.78	2.84	2.80	7.42	2.81 b
T_3 = 90% CF +10% ground limestone	3.30	2.81	3.53	9.64	3.21ab
T_4 = 85% +15% ground limestone	3.58	3.87	3.64	11.09	3.70a
Grand total				37.46	
Grand mean					3.12

Note: Treatment mean the same letter are not significant to each other (T4 and T3) using DMRT.

The above table shows the amount of feed consumed to gain kilogram body weight. Highly significant differences among treatment means was observed, Birds fed with 15% GL and 10% GL significantly consumed more feed (3.70 and 3.21 kg) to gain one kilogram body weight compared to birds fed with 5% GL and 100% CF (2.81 kg and 2.77 kg). This means that birds fed with 10% GL and 15% GL were less efficient converters of fed to meat. Bird fed with 100% CF still the most efficient converters, it requires 2.77 kg feed to produce one kilogram body weight.

Table 8: Feed Cost (Php)

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	53.63	55.91	61.89	171.44	57.15 c
T_2 = 95% +5% ground limestone	55.87	57.08	56.28	169.23	56.41b
T_3 = 90% CF +10% ground limestone	64.57	54.98	69.07	188.62	62.87ab
T_4 = 85% +15% ground limestone	68.15	73.67	69.29	211.11	70.37 a
Grand total				740.40	
Grand mean					61.70

Note: Treatment mean with the same letter are not significant to each other (T4and T3) using DMRT.

Table 8 showed feed cost per kg gain in weight of experimental broilers. Analysis of variance showed significant differences among treatment means. Birds fed with 15% GL obtain the highest feed cost followed by 10% GL. Birds fed with 5% GL obtained the lowest feed cost. Replacing CF with 5% GL significantly reduce the feed cost from Php 57.15 to Php 56.41. However it was observed that replacing CF with GL at higher levels significantly increase the feed cost.

Carcass Evaluation

Table 9: Bled weight of broilers (grams)

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	1313	1305	1235	3853	1284.33
T_2 = 95% +5% ground limestone	1457	1399	1479	4335	1445.00
T_3 = 90% CF +10% ground limestone	1355	1287	1288	3880	1293.00
T_4 = 85% +15% ground limestone	1397	1194	1195	3786	1262.00
Grand total				1586	
Grand mean					5284.66

Table 9 showed the bled weight of broilers fed with different levels of ground limestone .Analysis of variance showed no significant differences among treatment means. Birds fed with 5% GL obtained the highest bled weight followed by 10%GL , 100%CF, 15%GL with the corresponding mean 1293 grams 1284.33 grams, 12.62.00 grams respectively.

Table 10: Weight of broilers after plucking (grams)

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	1337	1235	1174	3746	1248.67
T_2 = 95% +5% ground limestone	1076	1246	1391	3713	1237.67
T_3 = 90% CF +10% ground limestone	1325	1179	1222	3726	1242.00
T_4 = 85% +15% ground limestone	1329	1107	1152	3588	1196.00
Grand total				14773	
Grand mean					1231.08

Table 10 Shows the weight of broilers after plucking (removal of the feathers) Analysis of variance showed no significant differences among the treatment means. Bird fed 100% CF had the highest weight (1248.67) followed by 10%GL, 5%GL and 15%GL with corresponding mean 1242 grams, 1237.67 grams and 1196 grams respectively.

Table 11: Weight of drumstick of broilers (grams)

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	305	292	256	853	284.33
T_2 = 95% +5% ground limestone	265	296	286	847	282.33
T_3 = 90% CF +10% ground limestone	274	281	256	811	270.33
T_4 = 85% +15% ground limestone	264	218	253	735	245.00
Grand total				3446	
Grand mean					270.50

Weight of drumstick of broilers showed in table 11. Analysis of variance showed no significant different among treatment means. Birds fed with 100% CF obtained the highest weight (284.33 g) of drumstick followed by 5% GL,10% GL and 15% GL with the corresponding treatment mean 282.33 grams, 270.33 grams and 245 grams.

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Table 12: Weight of shank of broilers (grams)

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	82	57	48	187	62.33
T_2 = 95% +5% ground limestone	53	67	67	187	62.33
T_3 = 90% CF +10% ground limestone	59	59	56	174	58.00
T_4 = 85% +15% ground limestone	74	55	51	180	60.00
Grand total				728	
Grand mean					6067

Table 12 shows the weight of shank of broilers fed with different levels of ground limestone. Analysis of variance showed no significance difference among treatment means.

Table 13: Weight of breast of broilers (grams)

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	275	317	264	856	285.33
T_2 = 95% +5% ground limestone	293	321	321	868	289.33
T_3 = 90% CF +10% ground limestone	236	221	259	716	238.67
T_4 = 85% +15% ground limestone	275	219	288	782	260.67
Grand total				3222	
Grand mean					268.50

Table 13 showed the weight of breast of broilers. Analysis of variance showed no significant differences among treatment means. Bird fed 5%GL obtained the highest weight of breast followed by 100% CF, 15%GL and 10%GL with the corresponding treatment mean 285.3 grams , 260.67 grams and 238.67 grams respectively.

Table 14: Weight of head of broilers (grams)

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	49	43	41	133	44.33
T_2 = 95% +5% ground limestone	38	42	43	123	41.00
T_3 = 90% CF +10% ground limestone	35	37	42	114	38.00
T_4 = 85% +15% ground limestone	41	33	43	119	39.67
Grand total				489	40.75
Grand mean					

Table 14 shows the weight of head of broilers fed with different levels of ground limestone. Analysis of variance showed no significant differences among treatment means. Bird fed 100%CF had the highest weight of head followed by 5%GL, 15%GL and 10%GL with the corresponding treatment means 41.00 grams , 39.67 grams and 38.00 grams.

Table 15: Heart weight of broilers in grams

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	11	9	9	29	9.67
T_2 = 95% +5% ground limestone	9	11	11	31	10.33
T_3 = 90% CF +10% ground limestone	9	8	8	25	8.33

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T_4 = 85% +15% ground limestone	9	8	9	26	8.67
Grand total				111	
Grand mean					9.25

Table 15 shows heart weight of broilers. Analysis of variance showed no significant differences among treatment means. Bird fed 5%GL obtained the highest weight of heart followed by 100%CF, 15%GL, and 10%GL with the corresponding treatment means 9.67 grams, 8.67 grams and 8.33 grams respectively.

Table 16: Liver weight of Broilers in Grams

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	38	35	37	110	36.67
T_2 = 95% +5% ground limestone	51	33	42	126	42.00
T_3 = 90% CF +10% ground limestone	43	37	47	127	42.33
T_4 = 85% +15% ground limestone	44	40	49	133	44.33
Grand total				496	
Grand mean					41.33

Table 16 shows the weight of liver of broilers. Analysis of variance showed no significant differences among treatment means. Bird fed 15%GL had the highest weight of liver. GL is higher than 100%CF.

Table 17: Gizzard weight of broilers in grams

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	66	44	57	167	55.67
T_2 = 95% +5% ground limestone	63	44	54	161	53.67
T_3 = 90% CF +10% ground limestone	55	39	57	151	50.33
T_4 = 85% +15% ground limestone	61	60	49	170	56.67
Grand total				649	
Grand mean					54.09

Table 17 shows the weight of gizzard. Analysis of variance showed no significant among the treatment means. Bird fed 15%GL obtained the highest weight of gizzard followed by 100%CF, 5%GL and 10%GL with the corresponding treatment means 55.67 grams, 53.67 grams and 50.33 grams.

Table 18: Intestine weight of broilers in grams

Treatment	Replication			Treatment	
	1	2	3	Total	Mean
T_1 = 100% commercial feeds	125	26	95	246	82
T_2 = 95% +5% ground limestone	161	84	147	392	130.67
T_3 = 90% CF +10% ground limestone	149	102	141	392	130.67
T_4 = 85% +15% ground limestone	232	113	95	440	146.67
Grand total				1470	
Grand mean					122.50

Table 18 shows the weight of intestine of broilers. Analysis of variance showed no significant differences among treatment means. Birds fed 15%GL had the highest weight among treatment means followed by 5% GL and 10% GL which had the same treatment means. Bird fed 100% obtained the lowest weight of intestine.

Summary of findings

Result showed birds fed with 100%CF obtained the highest final weight significantly higher than those birds fed with 15% GL but comparable to birds fed with 5% GL and 10% GL. The results indicate that replacing CF with 15% GL significantly decreased the final weight of broilers.

In terms of feed consumption experimental birds consumed comparable amount of feed.

As to total and daily gain in weight birds fed 100% CF and 5 % GL significantly gained more weight than those birds fed with 10% and 15% ground limestone replacement. Birds fed with 100% CF and 5% GL had comparable average daily gain in weight but significantly higher than those birds fed with 10% GL and 15% GL. This means that replacing CF with 10% GL and 15% GL significantly reduce the daily gain in weight of the birds. In terms of feed conversion efficiency Birds fed with 15% GL and 10% GL significantly consumed more feed (3.70 and 3.21 kg) to gain one kilogram body weight compared to birds fed with 5% GL and 100% CF (2.81 kg and 2.77 kg). This means that birds fed with 10% GL and 15% GL were less efficient converters of fed to meat. As to feed cost birds fed with 15% GL obtain the highest feed cost followed by 10% GL. Birds fed with 5% GL obtained the lowest feed cost. Replacing CF with 5% GL significantly reduce the feed cost from Php 57.15 to Php 56.41. However it was observed that replacing CF with GL at higher levels significantly increase the feed cost. Based on carcass evaluation all treatments has comparable bled weight, carcass weight, weight of the cut up parts (Head, Shank, drumstick, breast) and weight of internal organs (Liver, heart, intestine and gizzard)

4. CONCLUSIONS

Based on the result the researcher conclude:

1. that ground limestone can replace commercial feed up to 10% for broiler production.
2. that replacing CF with 10% GL and 15% GL significantly reduce the daily gain in weight of the birds.
3. that replacing CF with GL at higher levels significantly increase the feed cost.

Recommendation

1. In the light of the findings and conclusions, the following are forwarded as recommendations.
2. Commercial feeds can be replaced by 10% ground limestone when used as feeds for broilers.
3. Further research should be conducted to other types of chicken (Native, Sasso, and Kabir)
4. Similar study should be conducted to other types of birds (duck, geese and others)

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