

GROWTH PERFORMANCE OF BROILER FED WITH DIFFERENT LEVEL OF GMELINA (*Gmelina arborea*) LEAF MEAL

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ABSTRACT

A study to determine the growth performance of broiler fed with different levels of Gmelina Leaf Meal was conducted at Newsite, Bulacan Agricultural State College, San Ildefonso, Bulacan

A total of ninety straight run day-old broilers were used in the study. The experimental design used was Randomized Complete Block Design with three treatments replicated three times.

Results of the study revealed that birds in Treatment 3 gave the highest average weekly gain in weight, average final weight, and the efficient converter of feeds to meat. Regarding the average feed consumption. Treatment 1 consumed the largest amount of feeds. However, analysis of variance revealed that there was no significant difference among treatments on the growth performance of broilers. Considering the cost and return of analysis. Treatment 3 gave the highest return on investment.

It was also observed that the use of 10% gmelina leaf meal in the ration improved the growth performance of broiler. Therefore, the same level is recommended to reduce the feed cost and increase net income in broiler production.

Keywords: Broiler, Feed Conversion Ratio, *Gmelina arborea*, Growth Performance, Leaf Meal.

INTRODUCTION

A broiler is a type of chicken raised specifically for meat production. Modern commercial broilers, typically known as Cornish crosses or Cornish-Rocks are specially bred for large scale, efficient meat production and grow much faster than egg or traditional dual purpose breeds. They are noted for having very fast growth rates, a high feed conversion ratio, and low levels of activity. Broilers often reach a harvest of weight of 4-5 pounds dressed in only five weeks.

They have white feathers and yellowish skin. This cross is also favorable for meat production because it lacks the typical “hair” which many breeds have that necessitates singeing after plucking. Both male and female broilers are slaughtered for their meat. In 2003, approximately 42 billion broilers were produced, 80% of which were produced by four companies: Aviagen, Cobb-Vantress, Hubbard Farms, and Hybro (<http://en.wikipedia.org/wiki/Broiler>)

Gmelina arborea (gmelina) is a medium to large tree that reaches 35 m in height and more than 3 m in diameter in natural stands in tropical and subtropical regions of Asia (Dvorak 2003)

Gmelina arborea tree have smooth bark that is pale brown to grey color in young trees; in the old trees, it has a tan color (Patiño et. Al, 1982 in Patiño et. Al. 1993; Duke 1983). Gmelina heartwood also has pale brown to tan color and whitish colored sapwood. The wood color turns yellow brown upon exposure to the air after being sawn or chipped (Rao and Juneja 1971 in Dvorak 2003)

Gmelina leaves have a high nutrient composition 80.58% dry matter (DM), 12.5% crude protein (CP), 0.45% Calcium (Ca) than gmelina fruits (78.49% DM, 5.51% CP, 0.29% Ca) Gmelina fruits had higher phosphorus (0.34%) than its leaves (0.32%) Gmelina leaves had higher cell wall components than its fruits. Both gmelina leaves and fruits contained 1.76% and 1.62% tannic acid and 1.29% and 1.09% coumarin, respectively. The vitro-dry matter digestibility (IVOMD) of 86.39% were higher ($p < 0.01$) in gmelina fruits compared to IVDMD (41.45%) and IVOMD (71.68%) of its leaves.

The high cost of feeds and other feed supplements caused low income to small scale poultry raisers. The advantage that encourages farmers to engage in poultry farming is the fact that chickens are efficient converters of some conventional feeds stuffs of poor quality into meat and eggs, hence this study.

Statement of the Problem

This study was conducted to find out the growth performance of Broiler fed with different levels of gmelina leaf meal.

Specifically, it will answer the following questions:

1. Which level of gmelina leaf meal gave the heaviest weekly gain in weight and final weight of Broiler?
2. Which level of gmelina leaf meal provided the best feed conversion ration of Broiler?
3. Which level of gmelina leaf meal obtained the highest on return on investment?

Significance of the Study

For poultry, free range was the dominant until the discovery of vitamins A and D in the 1920s, which allowed confinements to be practiced successfully on a commercial scale. Before that, green feed and sunshine (for the vitamin D) were necessary to provide the necessary vitamin content. Some large commercial breeding flocks were reared on pasture into the 1950s. Nutritional science resulted in the increased use of confinement for other livestock species in much the same way (Heuser, 2003).

This study was significant to the poultry growers (both commercial and backyard raisers) it will guided them on the different alternative sources of protein which can be used as feed and give lower production cost in raising chicken. This study also benefits the people of the community as well as the consumers. It will also serve as guide for future researchers by giving them beneficial information about the gmelina leaf meal, when used as feed supplement for broiler.

Objectives of the Study

This study aims to determine the effect of growth performance of broiler fed with different levels of gmelina leaf meal.

Specifically to:

1. determine which level of gmelina leaf meal gave the heaviest weekly gain in weight and final weight of broiler;
2. identify which level of gmelina leaf meal provided the best feed conversion ratio on broilers;
3. find out which level of gmelina leaf meal obtained the highest return on investment.

Scope and Limitations of the Study

A total of ninety broiler chicks were used in this study which were divided into three treatments with 30 chicks per treatment.

It was conducted to determine the effect of different levels of gmelina leaf meal on growth performance of broiler. The researcher was used gmelina leaf meal as feed on broiler at 5%, and 10% levels. It was focused on the following criteria: average initial weight, and average weekly gain in weight, average final weight, average feed consumption and efficiency, cost and return analysis.

Location of the Study

The study was conducted at Bulacan Agricultural State College Newsite, Poblacion, San Ildefonso, Bulacan

Definition of Terms

Ad libitum feeding. Refers to the method of feeding in which animals are allowed to eat all they can at will.

Broiler. Is a type of chicken raised specifically for meat production. Modern commercial broilers, typically known as Cornish crosses or Cornish-Rocks are specially bred for large scale, efficient meat production and grow much faster than egg or traditional dual purpose breeds.

Brooder house. Pertains to a housing unit includes a heating device to keep young chicks warm.

Day old straight run chick. It is defined as a bird usually one day old of either sex.

Feed. Refers to any substance which when taken into the body could give nourishment to the animals.

Feed conversion ratio. Refers to the amount of feed required to produce a kilo gain in weight of the animal being fed.

Gain in weight. Pertains to the weight increment of bird in a given period of time.

Gmelina arborea Roxb. (family Verbenaceae) Is a fast growing tree frequently planted in plantations to produce wood for light construction, crafts, decorative veneers, pulp, fuel, and charcoal. The species is also planted in *taungya* systems with short rotation crops and as a shade tree for coffee and cacao. It is commonly called gmelina and white beech (English) melina (Spanish), gamar in Bangladesh, melina/gambar in India, gemelina in Indonesia, yemane in Philippines and soh in Thailand and it has many regional names.

Meal. Is any ingredient that has been ground or otherwise reduced to particle size somewhat larger than flour.

Randomized Complete Block Design. Refers to one of the most widely used experimental designs in agricultural research. The design is especially suited for field experiments where the number of treatments is not large and the experimental area has a predictable productivity gradient. The primary distinguished feature of the RCBD is the presence of blocks of equal size, each of which contains all the treatments.

Ration. Is the amount of feed consumed by the animals within the period of 24 hours.

Rearing. Refers to the growing of chicks from the time they are removed from the brooder house to the time they are disposed or harvested.

Replication. Is the number of repetition of a complete set of treatment in an experiment.

REVIEW OF RELATED LITERATURE AND STUDIES

The reason why poultry is considered to be healthier than some other meats, is because the amount of cholesterol and fat is lower in a pound of chicken or turkey than in a pound of red meat (Herren, 1997)

Capuz (1987) stated that the broiler has exceptional good quality protein. His study showed that roaster boned breast contains 31.5% protein, three (3) ounces of raw boneless broiler fryer chicken meat contain 25% of the recommended daily allowance of protein for an active man doing physical work.

PCARRD (1987) suggested that giving a ration containing the right amount of protein for the different ages of bird is a must to minimize cannibalism.

DAR (1994) stated that chicken production has been one of the important sources of income among rural farmer.

Lopez (1993) pointed out that plant leaves are commonly processed into leaf meal for non ruminant animals particularly poultry. A good quality leaf meal must be kiln dried and dehydrated plant leaves can be a possible source of protein. Study on shrub leaf, tree leaves, leaf vines, grasses algae and other water plants showed that on a 90 percent dry matter basis, their protein content vary from 20 to 30 percent.

Abaygar (2009) claimed that consistent or any irregularity in feeding, results of fluctuations of body reserves, fleshing and uniformly which then leads to a decrease in production and inaccurate and erroneous management. Inconsistent feeding leads producers to constantly second guess the required feeds of birds by their weight adding and decreasing the feed provided according to the bird's weight.

F/FRED (1994) reported that *Gmelina arborea* Roxb. (family Verbenaceae) is a fast growing tree frequently planted in plantations to produce wood for light construction, crafts, decorative veneers, pulp, fuel, and charcoal. The species is also planted in *taungya* systems with short rotation crops and as a shade tree for coffee and cacao. It is commonly called gmelina and white beech (English) melina (Spanish), gamar in Bangladesh, melina/gambar in India, gemelina in Indonesia, yemane in Philippines and soh in Thailand and it has many regional names.

It is found in rainforest as well as dry deciduous forest and tolerates a wide range of condition from sea level to 1200 m elevation and annual rainfall from 750 to 5000 mm. It grows best in climates with mean annual temperature of 21-28°C (Jensen 1995). Gmelina grows best deep, well drained, base-rich soils with pH between 5.0 and 8.0. Growth is poor on thin, highly leached acid soils.

The leaves and fruits of gmelina are used for fodder in many parts of India (Mukherjee 1884, Benthall 1933, Laurie 1945). A number of the plant's parts have medical value. It also produces good quality honey.

METHODOLOGY

Research Design and Layout

Randomized Complete Block Design (RCBD) was used in the conduct of the study. There were three treatments and each treatment was replicated three times. The treatments were used as follows: Treatment 1 – control Treatment 2-5% gmelina leaf meal and Treatment 3-10% gmelina leaf meal. A total of ninety (90) birds were used.

R1T3	R2T1	R3T2
R1T1	R2T2	R3T3
R1T2	R2T3	R3T1

Figure 1. Experimental layout

Research Materials

The materials used in this experiment are the following: ninety (90) day old chicks, commercial feeds, gmelina leaf meal, feeding trough, waterer, weighing scale, record book, camera and tarpaulin.

Care and Management

The experimental was conducted in a slatted bamboo floor type of housing with an area of fifteen by six square feet. The cage was divided equally into nine partitions. The whole cage was used in the study it was elevated from the ground and fully enclosed by a net.

Before the arrival of the day-old chicks, the brooder and other equipments as well as the surroundings was cleaned and disinfected. Other accessories and lighting was installed in the brooder and in the rearing pen.

Upon the arrival of the chicks, they were placed in the brooding pen. Electric bulb (100 watts) were used to supply heat and light, empty sacks were placed on the wall as curtain

and old newspapers in the floor to maintain the desired temperature. Drinking water and pre-starter ration were given to the birds.

During the first three days, the feeds were scattered on the newspaper laid on the floor. On the fourth day, feeding trough was used up to the end of the study.

Uniform care and management of the experimental bird such as schedule of feeding, giving of clean fresh water and other management practices were adopted in all treatments.

Preparation, Mixing and Feeding of Gmelina Leaf Meal

Gmelina leaves were gathered, chopped sundried and milled. Mixing of the meal to the basal ration was at the rate of 5% for Treatment 2 and 10%, for Treatment 3. This was incorporated to the ration and it was given on the 15th day of the experimental birds.

Data Gathering

The following data was gathered:

Initial weight. The birds were weighed on the 14th day in order to obtain the initial weight.

Weekly gain in weight. One week after recording, the initial weight, the sample bird were weighed again. This was done weekly thereafter up to the end of the study.

Feed consumption. A ten kilogram basal ration was mixed with the different level of gmelina leaf meal per treatment. Whatever was the amount left in the container after one week of feeding was subtracted from the amount mixed to get the feed consumption.

Final weight. This was taken on the 35th day of the birds and was treated as the final weight.

Statistical Analysis

The data gathered was treated statistically using analysis of variance (ANOVA) for Randomized Complete Block Design (RCBD)

RESULTS AND DISCUSSIONS

This chapter presents the data gathered that were tabulated and analyzed statistically using the analysis of variance from Randomized Complete Block Design

Initial Weight

Table 1. Average initial weight (grams) of broiler

Treatment	Replication			Total	Mean
	1	2	3		
1	445	430	420	1295	431.67
2	470	490	460	1420	473.33
3	450	430	450	1330	443.33

Presented in Table 1 were the data on average initial weight of broiler before feeding with gmelina leaf meal. Treatment 2 obtained the highest initial weight with a mean of 473.33 grams followed by Treatment 3 and Treatment 1 with means of 443.33 and 431.67 grams, respectively.

Analysis of variance showed that there is no significant difference in the average initial weight as presented in Appendix Table 1. This means that distribution of samples in the different treatments was fair and equal.

Weekly Gain in Weight

Table 2. Average weekly gain in weight (grams) of broiler fed with different levels of gmelina leaf meal

Treatment	Replication			Total	Mean
	1	2	3		
1	366.67	376.67	400	1143.34	381.11
2	353.33	380	433.33	1166.66	388.89
3	383.33	463.33	396.67	1243	414.44

As exhibited in the table, birds in Treatment 3 had the highest gain in weight with a mean of 414.44 grams followed by Treatment 2 and Treatment 1 with means of 388.89 and

381.11 grams, respectively. It was observed that birds fed with 10% gmelina leaf meal improved the gain in weight of broiler.

Analysis of variance showed that there was no significant difference in the average weekly gain in weight as presented in Appendix Table 2.

Final Weight

Table 3. Average final weight (grams) of broiler fed with different levels of gmelina leaf meal.

Treatment	Replication			Total	Mean
	1	2	3		
1	1500.00	1550.00	1620.00	4670.00	1556.67
2	1530.00	1630.00	1760.00	4920.00	1640.00
3	1600.00	1820.00	1640.00	5060.00	1686.67

Table 3 presented the average of final weight of broiler fed with different levels of gmelina leaf meal. as shown in the table, birds in Treatment 3 fed with 10% gmelina leaf meal in the ration obtained the highest final weight having a mean 1686.67 grams followed by birds in Treatment 2 and Treatment 1 with means of 1640.00 and 1556.67 grams respectively. It was observed that birds fed with 10% gmelina leaf meal increased the final weight of broiler.

The analysis of variance as illustrated in Appendix Table 3 revealed no significant difference among treatments.

Feed Consumption

Table 4. Average feed consumption (grams) of broiler fed with different levels of gmelina leaf meal

Treatment	Replication			Total	Mean
	1	2	3		
1	1970	1970	2060	6000	2000.00
2	1970	1960	2055	5985	1995.00
3	1960	1970	2032	5962	1987.33

Table 4 presented the average feed consumption of broilers. Results showed that the birds in Treatment 1 fed with pure commercial feeds showed the highest feed consumption with a mean of 2000.00 grams, followed by the birds in Treatment 2 and Treatment 3 with means of 1995.00 and 1987.33 grams, respectively.

The analysis of variance as illustrated in Appendix Table 4 revealed no significant difference among treatments.

Feed Conversion Ratio

Table 5. Average feed conversion ratio of broiler fed with different levels of gmelina leaf meal.

Treatment	Replication			Total	Mean
	1	2	3		
1	1.79	1.74	1.72	5.25	1.75
2	1.86	1.72	1.58	5.16	1.72
3	1.70	1.42	1.71	5.00	1.61

As exhibited in Table 5, birds in Treatment 3 with a mean of 1.61 were the best converter of feeds into a kilogram live weight followed by birds in Treatment 2 and Treatment 1 with means of 1.72 and 1.75 kilograms, respectively. This further justify that 10% gmelina leaf meal in the ration reduced the feed intake of the broilers.

The analysis of variance as illustrated in Appendix Table 5 revealed no significant difference among treatments.

Cost and Return Analysis

Table 6. Cost and return analysis of producing broiler fed with different levels of gmelina leaf meal per treatment

I. INPUT	T1 (control)	T2 (5%)	T3 (10%)
Cost of day-old chicks (Php 20/birds) (30 birds/treatment)	600	600	600
Feeds Consumed (g) Chick booster (g)	20000.00	20000.00	20000.00
Cost (Php 0.027/g)	540.00	540.00	540.00
Chick starter (g)	60000.00	56857.50	53657.91
Cost (Php 0.027/g)	1620.00	1535.15	1448.76
Gmelina leaf meal (g)		2992.50	5961.99
Cost (Php. 0.005/g)		14.96	29.81
	80000.00	79850.00	79619.90

Total feeds consumed (g) Total cost of feeds (Php)	2160.00	2090.11	2017.57
Rental fee housing (Php 3.00/bird)	90	90	90
Light & Water (Php 3.00/bird)	90	90	90
Medicine (Php 3.00/head)	90	90	90
Labor (Php 2.00/bird)	60	60	60
Total Expenses (Php)	3090.00	3020.11	2947.57
II. OUTPUT			
Total weight produced (g)	46700.10	49200.00	50600.10
Sales of broiler (Php 0.080/g)	3736.01	3936.00	4048.01
Sales of chicken dung (Php 0.0008/g)	25.60	25.55	25.48
Sales of empty sack (Php 10.00/sacks)	16.00	15.37	14.73
Gross Sales (Php)	3777.61	3976.92	4088.22
III. NET INCOME (Php)	687.61	956.81	1140.65
IV. ROI (%)	22.25	31.68	38.70

As reflected in Table 6, the cost and return analysis of broilers fed with different levels of gmelina leaf meal showed that the birds in Treatment 3 gave the highest return on investment with 38.70% followed by the birds in Treatment 2 and Treatment 1 with 31.68% and 22.25% respectively. Increasing the level of gmelina leaf meal lessened the expenses on broiler production, thus increasing return on investment.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

A study to determine the growth performance of broiler fed with different levels of gmelina leaf meal was conducted at Bulacan Agricultural State College, Newsite, Poblacion, San Ildefonso, Bulacan.

Three treatment was used in this study, and they were as follows: Treatment 1 control, Treatment 2- 5% gmelina leaf meal, Treatment 3 – 10% of gmelina leaf meal. Each treatment was replicated three times with five birds per replication. A total of ninety (90) birds were used in this study.

Results of the study revealed that birds in Treatment 3 gave the highest average weekly gain in weight, average final weight and the efficient converter of feeds to meat followed by Treatment 2 and the lowest Treatment 1. Regarding the average feed consumption, Treatment 1 consumed the largest amount of feeds followed by Treatment 2 and the lowest was Treatment 3. However, analysis of variance revealed that there was no significant difference among treatments on the growth performance of broiler.

On the cost and return analysis, Treatment 3 gave the highest return on investment, followed by the birds in Treatment 2 and the last was Treatment 1.

Conclusion

Feeding of gmelina leaf meal improved the growth performance of broiler. It was also observed that the use of 10% gmelina leaf meal in the ration gave the highest on return on investment.

Recommendation

Ten percent gmelina leaf meal in the ration is recommended to reduce the cost of production, thus the return on investment in broiler production.

APPENDICES

Appendix Table 1. Analysis of variance on the average initial weight (grams) of broiler fed with different levels of gmelina leaf meals

Source of Variation	Degree of Freedom	Sum of Squares	Mean Square	Observed F	Tabular F	
					5%	1%
Treatment	2	2772.22	1386.11	6.57 ^{ns}	6.94	18.00
Replication	2	205.56	102.78			
Error	4	844.44	211.11			
Total	8	3822.22				

c.v. =3.23%

ns=not significant

Appendix Table 2. Analysis of variance on the average weekly gain in weight (grams) of broiler fed with different levels of gmelina leaf meals

Source of Variation	Degree of Freedom	Sum of Squares	Mean Square	Observed F	Tabular F	
					5%	1%
Treatment	2	1824.46	912.23	0.85 ^{ns}	6.94	18.00
Replication	2	3306.35	1653.18			
Error	4	4271.00	1067.75			
Total	8	9401.81				

c.v. =8.28%

ns=not significant

Appendix Table 3. Analysis of variance on the average final weight (grams) of broiler fed with different levels of gmelina leaf meals

Source of Variation	Degree of Freedom	Sum of Squares	Mean Square	Observed F	Tabular F	
					5%	1%
Treatment	2	26022.22	13011.11	1.78 ^{ns}	6.94	18.00
Replication	2	32155.56	16077.78			
Error	4	29177.78	7294.44			
Total	8	87355.56				

c.v. =5.25%

ns=not significant

Appendix Table 4. Analysis of variance on the average feed consumption (grams) of broiler fed with different levels of gmelina leaf meals

Source of Variation	Degree of Freedom	Sum of Squares	Mean Square	Observed F	Tabular F	
					5%	1%
Treatment	2	0.03	0.02	1.15 ^{ns}	6.94	18.00
Replication	2	0.04	0.02			
Error	4	0.06	0.01			
Total	8	0.13				

c.v. =7.03%

ns=not significant

Appendix Table 5. Analysis of variance on the average feed conversion ratio of broiler fed with different levels of gmelina leaf meals

Source of Variation	Degree of Freedom	Sum of Squares	Mean Square	Observed F	Tabular F	
					5%	1%
Treatment	2	0.00	0.00	0.18 ^{ns}	6.94	18.00
Replication	2	0.00	0.00			
Error	4	0.04	0.01			
Total	8	0.04				

c.v. =5.46%

ns=not significant

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