BIBLIOGRAPHY

LUDAS, RUSSEL A. APRIL 2013. Growth Performance of Colored Broiler Given Commercial Feeds Supplemented with Lima Bean (*Phaseolus lunatus*) Meal. Benguet State University, La Trinidad, Benguet.

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ABSTRACT

The study was conducted at Belong, Ambassador, Tublay, Benguet from August to September 2012 to determine the effect of lima bean seed meal in terms of growth rate, feed consumption, feed conversion ratio, morbidity and mortality rate and to determine which levels of lima bean seed meal will give the best result of the performance of colored broilers.

One hundred sixty 21 days old colored broilers were distributed following the Complete Randomize Design (CRD) into four treatments. Each treatment was replicated four times with ten birds per replicate. The treatment were T_0 - pure commercial feeds (CF), T_1 - 100g lima bean seed per kg CF, T_2 - 200g lima bean seed per kg CF, and T_3 - 300g lima bean seed per kg CF.

Statistical analysis showed no significant differences in the initial weight, final weight, total and daily gain in weight, and feed conversion ratio of colored broilers raised from 21 days to 60 days of age. Significant differences were observed in the total and daily feed intake, cost of feed to produce a kilogram gain in weight and return on investment.

The average initial weight, final weight, daily gain in weight and feed conversion ratio of colored broilers were 0.484, 1.956, 0.038 and 2.937, respectively. Birds given pure commercial feed and 300g lima bean had higher average daily feed intake (0.114 kg) compared to birds given100g (0.112kg) and 200g (0.110kg) lima bean.

The highest Return on Investment was observed in the birds given with 100 grams of ground lima bean seed 19.10%, followed by pure commercial feeds with 17.54% and the birds given with 200 grams and 300 grams ground lima bean seed had obtained an ROI of 12.65% and 11.08% respectively.

INTRODUCTION

Feeding has a great effect in the growth performance of broilers. It is important that poultry raisers need to know and understand the nutritional requirement, care, and feeding management of broiler s to come to cheap nutritional balanced ration. Using locally feed resources is possible. One of this a popular seed crop called lima bean known for its buttery taste so often called butter beans.

Lima bean (*Phaseolus lunatus*) a starchy yet buttery taste and are often called butter beans in the southern part of the United States. Lima beans can be bought fresh during the summer and fall but are always available canned, dried and frozen. Lima beans, like other beans, are a healthy part of a good diet. Lima beans are a good source of B vitamins including B6, niacin and folate. Lima beans also are a good source of manganese and iron. Lima beans, like most beans, are a great source of dietary fiber. One cup of lima beans provides 65 percent of your daily value for fiber. Lima beans help lower blood sugar levels. Because of their high fiber content, lima beans keep you feeling full and keep your blood sugar at an even level. Lima beans are also a source of potassium, magnesium and iron. They provide 86 percent of the daily value of molybdenum, a mineral that helps detoxify sulfites. One cup of cooked lima beans provides 216 calories. Calories from fat are very low--about 6. Limas are a very nutritious, low-fat food.

The study aimed to utilize cheap feed resources to help poultry raisers produced a birds more economically so to lessen the cost of production. This study was conducted to find out whether using lima bean seeds as feed supplement is effective and productive or not. This study's result not only benefit the farmers but can serve as benchmark data for further studies on better and cheaper feed supplement.

The general objective of this study was to determine the effect of lima bean seed meal as feed supplement to French chicken. Specifically, it aimed to determine the effect of lima bean seed meal in terms of growth rate, feed consumption, feed conversion ratio, morbidity and mortality rate and to determine which levels of lima bean seed meal will give the best result of the performance of broilers. It alsoamed to determine the profitability of raising broilers using home mixed ration of different levels of lima bean seed meal.

The study was conducted at Belong, Ambassador, Tublay, Benguet from August to September 2012.

REVIEW OF LITERATURE

Sometimes called "butter beans" because of their starchy yet buttery texture, lima beans have a delicate flavor that complements a wide variety of dishes. Although fresh lima beans are often difficult to find, they are worth looking for in the summer and fall when they are in season. Dried and canned lima beans are available throughout the year. The pod of the lima bean is flat, oblong and slightly curved, averaging about three inches in length. Within the pod are the two to four flat kidney-shaped seeds that we call lima beans. The seeds are generally cream or green in color, although certain varieties feature colors such as white, red, purple, and brown or black (Wood, 1988).

The chemical composition of lima beans; the dried pulse contains about 12.6%, protein 20.7%, fat 1.3%, carbohydrate 57.3%, fiber 4.3%, and ash 3.8 %. The green beans contain about water 66.5%, protein 7.5%, fat 0.8%, carbohydrate 22.3%, fiber 1.5 %, and ash 1.7%. The mature beans contain the glucoside phaseolutanin, which gives them their characteristic flavor. Under damp condition or when tissues are broken down by chewing or grinding, an enzyme present in the seeds causes the liberation of hydrocyanic acid. Large lima beans of Inca type and small lima of Hopi type contains 25 to 55 p.p.m. HCN which is far below to the tolerance set by law in the United States of 100 p.p.m HCN. Carib type beans contain dangerous quantities of HCN and a wild lima bean in Puerto Rico gave 997 p.p.m. HCN. The HCN content is greater in colored beans; white seed types are relatively free, but over 100 p.p.m. HCN has been recorded in a few cases (Mackie, 1943 and Heiser, 1965).

Lima bean nutritional values are touted for their high fiber content. Not only does fiber control and stabilize blood sugar from rising too quickly after eating, but it also provides a slow and steady complex carbohydrate energy burn. One cup of lima beans provides 65.8 percent of the daily fiber value requirements; 24.9 percent of the required iron; and 48.5 percent of the daily requirement of manganese, which plays an important role in antioxidant defenses and energy production. Lima beans and other legumes may be used as a meat substitute. When combined with a whole grain source, lima beans provide a low-fat whole protein source, with 29.3 percent of the daily protein recommendation in one cup. Cyanide compounds are present in lima beans and they should therefore not be eaten raw unless they are among the low-cyanogen varieties. Western countries, such as the United States, restrict commercially grown lima bean production to those with low cyanogen levels. In some other countries, including Java and Burma, these legumes have 20 to 30 times more the cyanogen than is permitted in most Western countries. These high-cyanogen beans require longer cooking times to drive out the hydrogen cyanide gas (McIntosh and Miller, 2001).

Lima bean health benefits are 100g beans contain 338 cal per 100g and provide 21.46g or 38% of protein. In addition, lima are rich source of antioxidants, vitamins, minerals, and plant sterols. The beans, fresh or dried, contain substantial amounts of dietary fiber (50% per100g RDA). Dietary fiber functions as bulk laxative, which helps to protect the mucous membrane of the colon by decreasing its exposure time to toxic substances as well as by binding to cancer causing chemicals in the colon. Dietary fiber has also been shown to reduce blood cholesterol levels by decreasing re-absorption of cholesterol binding bile acids in the colon. Unlike soybeans, lima contain very small amounts of *isoflavones*.

Isoflavone such as *genistein* and *daidzein* have been found to protect breast cancer in laboratory animals. However, they are plentiful in plant sterols (phytosterols) especially *ß-sitosterol* that help lower cholesterol levels in the body. Fresh as well as dry lima are excellent source of folates. 100g dry mature beans provide 395 µg or 99% of folates. Folate along with vitamin B-12 is one of the essential components of DNA synthesis and cell division. Adequate folate in the diet around conception and during pregnancy may help prevent neural-tube defects in the newborn baby. Lima as well as thin butter beans is very rich source of many vitamin B, especially vitamin-B6 (pyridoxine), thiamin (vitamin B-1), pantothenic acid, riboflavin, and niacin. Most of these vitamins functions as co-enzymes in carbohydrate, protein, and fat metabolism. In addition, lima and butter beans are one of the excellent sources of minerals like molybdenum, iron, copper, manganese, calcium, magnesium. They have more potassium than red kidney beans (1359 mg), broad beans (1062 mg), black beans (1483 mg). Potassium is important electrolyte of cell and body fluids. It helps counter pressing effects of sodium on heart and blood pressure. *Manganese* is used by the body as a co-factor for the powerful anti-oxidant enzyme, *superoxide dismutase* (Menotti *et. al*, 1999).

MATERIALS AND METHODS

Materials

The materials and equipment that were used in the study include 160 day old colored broiler, brooding-rearing cages, broiler commercial feeds, disinfectant, feed containers, drinking and feeding troughs, electric bulbs (100 watts), old newspapers, waterers, feederers, weighing scale, NCD vaccine, record book and ground lima bean seed meal.

Methodology

Pre- Experimental period. The stock was procured from a reliable distributor of day old chicks in Baguio City and the lima bean seed was purchased and collected from reliable farmers of lima bean in Tublay and La Trinidad, Benguet.

Preparation of brooding and rearing cages. The brooder and rearing cages were cleaned thoroughly and sprayed with disinfectant which includes drinking and feeding troughs which was done one week before the arrival of the chicks. After three days, old newspapers sheets was spread to cover the floor of the brooder to conserved heat and to prevent entrance of draft. It served as receptacles for the feeds in the first few days and also maintaining the temperature desired by the chicks. Finally, two hours before the arrival of the chicks, the brooder cage was lightened to ensure uniform brooding temperature requirement.

Arrival of the stocks. Upon the arrival of the chicks, they were placed in the brooding cages and brooded as a group. They were subjected to the same care and management. At seven days old, they were vaccinated against New Castle Disease (NCD) vaccine.

They were fed with commercial chick booster feeds until reached their 15th days old. To ensure good health of the birds, drinking water to be given to them was medicated with vetracine multi-vitamin soluble particularly in their first two weeks.

Experimental period. On the 21st day brooding, chicks were divided randomly into four treatments following the Randomized Complete Block Design (RCBD). Each treatment was replicated four times with 10 birds per replication making a total of 40 birds per treatment.

The following treatments were as follows:

T_0 - Pure commercial feeds (PCF)

T_1 - 100g ground lima bean seed per kilogram commercial feeds (GLBS/KgCF)

T_2- 200gground lima bean seed per kilogram commercial feeds (GLBS/KgCF)

T_3 - 300gground lima bean seed per kilogram commercial feeds (GLBS/KgCF)

The birds in all treatments were subjected to the same care and management except on the levels of lima bean seed meal added to their ration. The birds on the T_0 were given pure commercial feeds, while the birds assigned to T_1 were given 100 grams lima bean per kilogram commercial feeds, T_2 were given 200 grams lima bean per kilogram commercial feeds, and T_3 were given 300 grams lima bean per kilogram commercial feeds. Feeding the birds was done three times a day, 6:00 in the morning, 12:00 at noontime, and 5:00 in the afternoon. During the first two weeks, the birds were fed with chick booster, followed by broiler starter crumbles for the next two weeks and lastly, finisher crumbles until the termination of the study. Fresh water was always made available. Feeding and drinking troughs were cleaned daily to maintain the good health of the birds. The light were switched on during the night and switched off during the day.

Preparation of lima bean seed meal. Lima bean seeds was bought from farmers of La Trinidad and Tublay and then removed from its shell and then later roasted and ground to into seed meal. The resulting meal was added manually to the commercial feeds on the specified level of treatments.

Data Gathered

1. Initial weight of the birds (kg). This was obtained by weighing the chicks individually at the start of the study (21 days of age).

2. Final weight of the birds (kg). This refers to the weight of the birds at 60 days of age.

3. Feed offered (kg). This refers to the amount of feeds consumed by the birds from the start of the study until the end of the experiment. This was taken by adding all the feeds offered to the birds after the left-over have been subtracted.

4. Feed left-over (kg). This refers to the feeds left in the feeding trough taken every morning before feeding.

5. Feed cost. This refers to the cost of commercial feeds and lima bean given to each treatment.

Data Computed

1. Average initial weight. This was obtained by dividing the total weight per replicate by the number of birds per replicate.

$$\text{Average Initial Weight} = \frac{\text{Total Weight per Replicate}}{\text{No. of Birds per Replicate}}$$

2. Gain in weight of the birds (kg). The gain in weight of growing and fattening animals can be determined on a total and daily basis using the following formula:

$$\text{Total Gain in Weight} = \text{Final Weight} - \text{Initial Weight}$$

$$\text{Average Daily Gain} = \frac{\text{Total Gain in Weight}}{\text{No. of Days on Test}}$$

3. Feed consumption (kg). It can be expressed as total and daily consumption. This was determined using the formula:

$$\text{Total Feed Intake} = \text{Amount of Feed Offered} - \text{Amount of Feed Left-over}$$

$$\text{Daily Feed Intake} = \frac{\text{Total Feed Intake}}{\text{No. of Days on Test}}$$

4. Feed conversion ratio (FCR). This was obtained by dividing the total feed consumption by the total gain in weight of the birds.

$$\text{FCR} = \frac{\text{Total Feed Consumption}}{\text{Total gain in weight}}$$

5. Cost of feed to produce a kilogram gain in weight (Php). This was taken by multiplying the feed conversion ratio by the average price of the feeds per kilo.

6. Returned on investment (ROI). This was obtained by using thisformula:

$$\text{ROI} = \frac{\text{Net Profit}}{\text{Total Cost of Production}} \times 100$$

Statistical Analysis of Data

All of the data gathered were consolidated, tabulated and subjected to analysis of variance for Completely Randomized Designed (CRD). The Duncan's Multiple Range Test (DMRT) was used to compare treatment means.

RESULTS AND DISCUSSION

Initial and Final Weight

Table 1 presents the initial weight at 21days of age of birds in all treatments. Statistical analysis revealed that there were no significant differences in the initial weight of birds among treatment means. This implies that the birds were homogenous at the start of the study.

The final weight at 60 days of age of broilers in all treatments is also shown in Table 1. Statistical analysis showed no significant differences in the final weight among treatments. The average final weight of colored broilers at 60 days of age is 1.96kg. While lima bean seed is high in protein, magnesium, iron and calcium content of lima bean seed and said to enhance muscle deposition in the birds (Ambler *et al*, 1994), it did not effect any improvement in the growth performance of broilers.

Table 1. Initial weight at 21 days and final weight of the birds at 60 days of age

TREATMENT	WEIGHT	
	INITIAL (kg)	FINAL (kg)
Pure commercial feeds	0.48[a]	1.91[a]
100g ground lima bean seed /kg CF	0.48[a]	2.00[a]
200g ground lima bean seed /kg CF	0.48[a]	1.93[a]
300g ground lima bean seed /kg CF	0.49[a]	1.99[a]

Means with the same letter superscript are not significantly different at 5% by DMRT.

Total and Daily Gain in Weight

Table 2 presents the average total and dailygain in weight of the colored broilers in different treatments. Statistical analysis shows no significant difference among treatment means both in total and daily gain in weight.The average total and daily gain in weight of the birds from 21 to 60 days of age in different treatment were 1.47kg and 0.038kg, respectively. Adding 100g to 300g of lima bean to the commercial diets of colored broilers did not cause any significant effect on the gain in weight of birds.

Total and Daily Feed Intake

Table 3 presents the average total and daily feed intake of the birds in the different treatments for a total feeding period of 39 days (from 21 to 60 days of age). Statistical analysis showed highly significant differences both in the total and daily feed intake of broiler birds among the treatments. The total feed intake of birds given pure commercial feeds (4.43kg) and those given 300g lima beans (4.43kg) is significantly higher than the total feed intake of birds 100g lima bean (4.38kg). Birds given 200g lima beans had the lowest total feed intake of 4.28kg.

As to the daily feed intake of the birds, birds given pure commercial feed and 300g lima bean consumed more feed (0.114 kg) compared tobirds given with 100g (0.112kg) and 200g (0.110kg) lima bean.

During the experimental period, it was observed that birds given with pure commercial feeds had lesser feed left-over as compared with birds given with different levels of lima bean. Furthermore it was observed that birds given with pure commercial feeds are more active during feeding time than of the birds given with different level of lima bean.

Table 2. Total gain in weight and average daily gain in weight

TREATMENT	GAIN IN WEIGHT	
	TOTAL (kg)	DAILY (kg)
Pure commercial feeds	1.43[a]	0.037[a]
100g ground lima bean seed /kg CF	1.52[a]	0.039[a]
200g ground lima bean seed /kg CF	1.44[a]	0.037[a]
300g ground lima bean seed /kg CF	1.46[a]	0.039[a]

Means with the same letter superscript are not significantly different at 5% by DMRT.

Table 3. Total and average daily feed intake

TREATMENT	FEED INTAKE	
	TOTAL (kg)	DAILY (kg)
Pure commercial feeds	4.43[a]	0.114[a]
100g ground lima bean seed /kg CF	4.38[b]	0.112[b]
200g ground lima bean seed /kg CF	4.28[c]	0.110[c]
300g ground lima bean seed /kg CF	4.43[a]	0.114[a]

Means with the same letter superscript are not significantly different at 5% by DMRT.

Feed Conversion Ratio

Table 4 presents the mean feed conversion ratio of colored broilers during the experimental period of 39 days (from 21 to 60 days of age) in the different treatments. Statistical analysis showed no significant differences between treatments. The average FCR of birds from 21 to 60 days of age was 2.94. It appears that the inclusion of 100 to 300g of lima bean seeds per kg of commercial feed resulted in the same feed efficiency to the ration without lima bean seed.

Table 4. Feed conversion ratio

TREATMENT	FEED CONVERSION RATIO
Pure commercial feeds	3.11[a]
100g ground lima bean seed /kg CF	2.89[a]
200g ground lima bean seed /kg CF	2.93[a]
300g ground lima bean seed /kg CF	2.97[a]

Means with the same letter superscript are not significantly different at 5% by DMRT.

Feed Cost to Produce a Kilogram Gain in Weight

Table 5 presents the feed cost to produce a kilogram gain in weight. Statistical analysis showed highly significantdifferenceamong treatment means. Birds given pure commercial feeds had least feed cost to produce a kilogram gain in weight of PhP80.74.For birds given 100g, 200g, and 300g lima bean seed per kg of commercial, the feed cost to produce a kg gain in weight were PhP 98.27, PhP 99.71 and PhP100.92, respectively. The additional feed cost was due to the addition of lima bean seed which was bought at PhP 50.00 per kg.

Return on Investment

Table 6 showed the return on investment in different treatments. Birds given 100g lima bean had the highest ROI of 19.10% followed by the birds given pure commercial feeds with an ROI of 17.54%. Birds given 200g and 300g lima bean have an ROI of 12.65% and 11.08%, respectively.

Table 5. Feed cost per kilogram gain in weight

TREATMENT	FEED COST (Php)
Pure commercial feeds	80.74[b]
100g ground lima bean/kg CF	98.27[a]
200g ground lima bean/kg CF	99.71[a]
300 g ground lima bean/kg CF	100.92[a]

Means with the same letter superscript are not significantly different at 5% by DMRT.

Table 6. Cost and return analysis

ITEMS	TREATMENTS			
	PCF	100g GLBS/KgCF	200g GLBS/KgCF	300g GLBS/KgCF
A. Total Sales	11,092.50	11,600.00	11,165.00	11,527.00
B. Total Expenses	9,147.00	9,384.00	9,753.00	10,250.00
C. Net Income	1,945.00	2,216.00	1,412.00	1,277.50
ROI	17.54%	19.10%	12.65%	11.08%

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

The study was conducted to determine the effect of different levels of lima bean seed on the growth performance of colored broiler. One hundred sixty 21 days old colored broilers were distributed following the Completely Randomized Designed (CRD) into four treatments. Each treatment was replicated four times with ten birds per replication, making a total of forty birds per treatment. The treatment were T_0 - pure commercial feeds (CF), T_1 - 100g lima bean seed per kg CF, T_2 - 200g lima bean seed per kg CF, and T_3 - 300g lima bean seed per kg CF.

Statistical analysis showed no significant differences in the initial weight, final weight, total and daily gain in weight, and feed conversion ratio of colored broilers raised from 21 days to 60 days of age. Significant differences were observed in the total and daily feed intake, cost of feed to produce a kilogram gain in weight and return on investment.

The average initial weight, final weight, daily gain in weight and feed conversion ratio of colored broilers were 0.484, 1.956, 0.038 and 2.937, respectively. Birds fed with pure commercial feed and 300g lima bean had higher average daily feed intake (0.114 kg) compared to birds feed with 100g (0.112kg) and 200g (0.110kg) lima bean per kg of commercial feed.

The highest Return on Investment was observed in the birds given with 100 grams of ground lima bean seed 19.10%, followed by the control with 17.54% and the birds given with 200 grams and 300 grams ground lima bean seed had obtained an ROI of 12.65% and 11.08%, respectively.

Conclusion

Based on the result of the study, ground lima bean seed can be incorporated in the ration of colored broilers from 21 days to 60 days of age without detrimental effect.

Recommendation

It is recommended that lima bean seed be used to ration of colored broiler. It is furtherrecommendedthe use of lima bean seed, particularly as part of a formulated ration, be conducted.

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